

حمل الآن

مجاناً وحصرياً

المراجعة رقم (1)

الترم الاول



physics

Mathematical Introduction

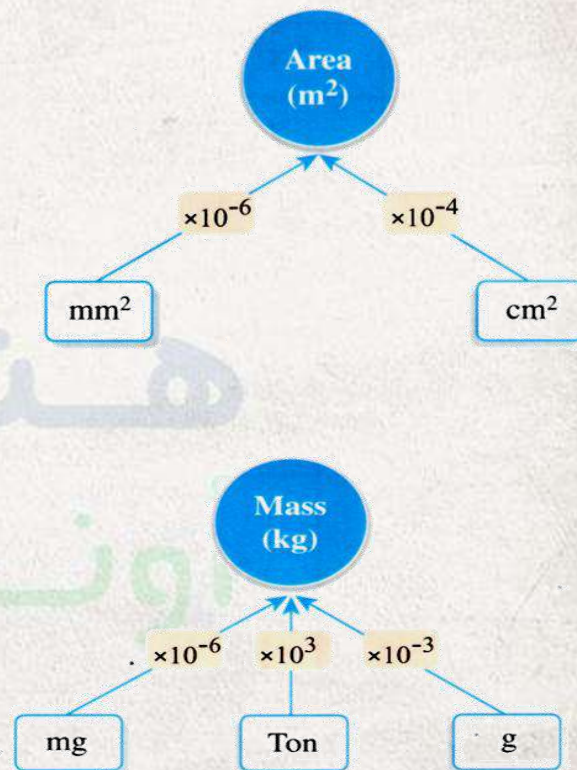
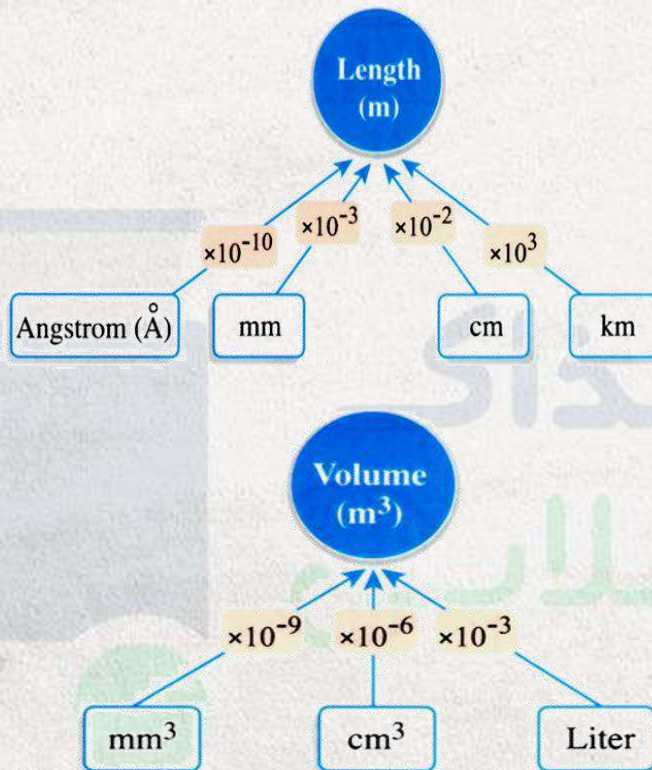


- 1 Common SI prefixes
- 2 Conversion units
- 3 Pythagorean
- 4 relations
- 5 geometrical figures
- 6 exponents
- 7 Proportionality
- 8 Graphical representation
- 9 Vectors

Prefix	Abbreviation	Meaning
Femto	f	
Pico	p	
Nano	n	
Micro	m	
Milli	m	
centi	c	
Deci	d	
Kilo	k	
Mega	M	
Giga	G	
Tera	T	

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Conversion of some units



1 Common SI prefixes

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3 **Pythagorean**

4 relations

5 geometrical figures

6 exponents

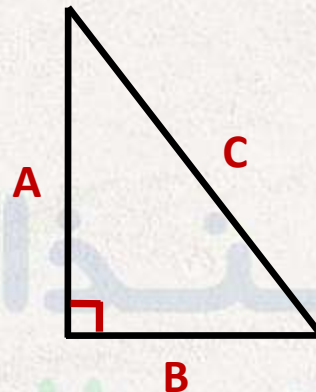
7 Proportionality

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Pythagorean theorem

In the triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides



$$C^2 = A^2 + B^2$$

$$C = \sqrt{A^2 + B^2}$$

Where: C is the hypotenuse and A, B are the other two sides.

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Trigonometrical relations

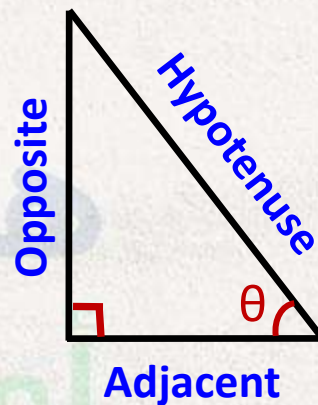
In the triangle, we can determine the trigonometrical ratios for the angle θ from the **following relations**:

$$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$



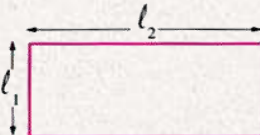
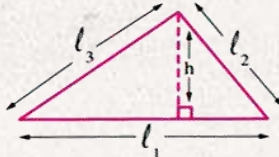
The sine of the double of the angle θ : $\sin 2\theta = 2\sin\theta \cos\theta$

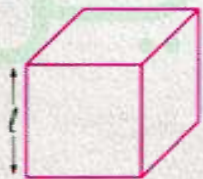
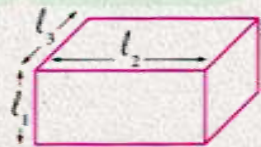
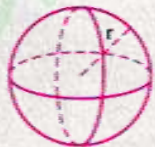
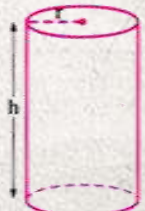
- Common SI prefixes
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Perimeters, areas and volumes of some geometrical figures



Geometrical figure	Square	Rectangle	Triangle	Circle
Figure shape				
Perimeter	$4l$	$2(l_1 + l_2)$	$l_1 + l_2 + l_3$	$2\pi r$
Area	l^2	$l_1 \times l_2$	$\frac{1}{2} l_1 \times h$	πr^2

Geometrical figure	Cube	Cuboid	Sphere	Cylinder
Figure shape				
Volume	l^3	$l_1 \times l_2 \times l_3$	$\frac{4}{3} \pi r^3$	$\pi r^2 \times h$

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Rules of exponents

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Proportionality

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Graphical representation

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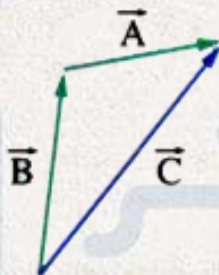


Vectors



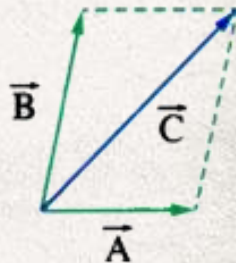
A Adding two vectors

(a) Joining the tail of $\vec{A}$ with the arrow of $\vec{B}$ or vice versa.



Or

(b) Joining their two tails.



$$\vec{A} + \vec{B} = \vec{C}$$

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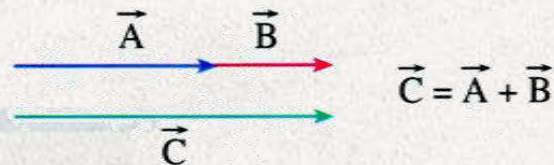
8 Graphical representation

9 Vectors

Vectors

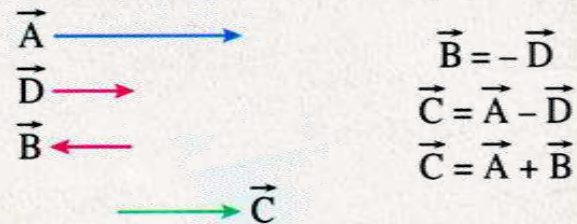
B

Adding two parallel (in the same direction) vectors



C

Adding two anti-parallel (in opposite directions) vectors



1 Common SI prefixes

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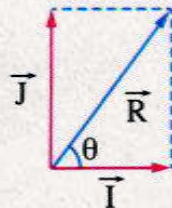
7 Proportionality

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Vectors

D Adding two perpendicular vectors



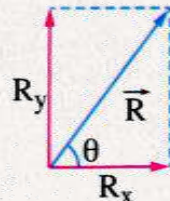
$$\vec{I} + \vec{J} = \vec{R}$$

$$R = \sqrt{I^2 + J^2}$$

$$I^2 + J^2 = R^2$$

$$\tan \theta = \frac{J}{I}$$

E Resolving a vector $\vec{R}$ into two perpendicular components



$$\cos \theta = \frac{R_x}{R}$$

$$R_x = R \cos \theta$$

$$\sin \theta = \frac{R_y}{R}$$

$$R_y = R \sin \theta$$

Chapter (1)

Physical measurements



1 Measurement process

2 Physical quantities

3 Measuring tools

4 Measuring units

5 Multiples and fractions

6 Dimensional formula

7 importance of the dimensional formula

8 Measurement error

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Physical Measurement



measurement



It is the process of comparing an unknown quantity with another known quantity of its kind to find out how many times the first includes the second.

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Physical Measurement



Key elements of measurement process

The physical quantity

Measuring tools

Units of measurement

Fundamental Physical
Quantities

Derived Physical
Quantities



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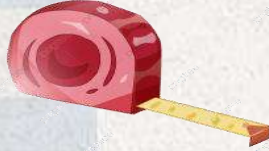


Physical Measurement



1 Length

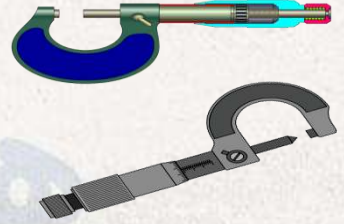
Meter tape



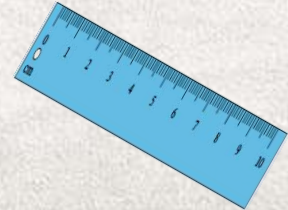
Vernier Caliper



Micrometer



Ruler



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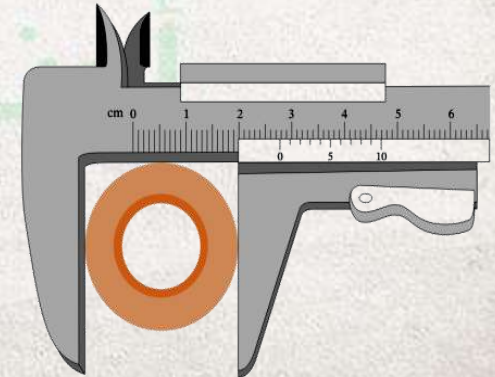
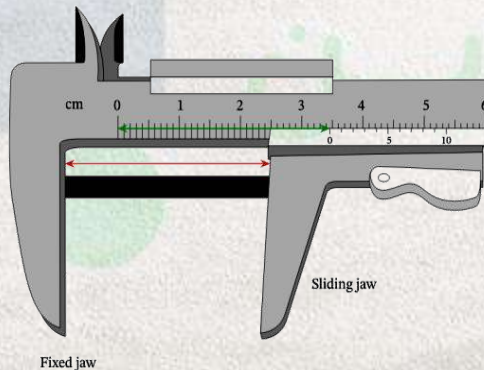
Physical Measurement



1 Length

Vernier Caliper

tool used to measure very small lengths at high accuracy



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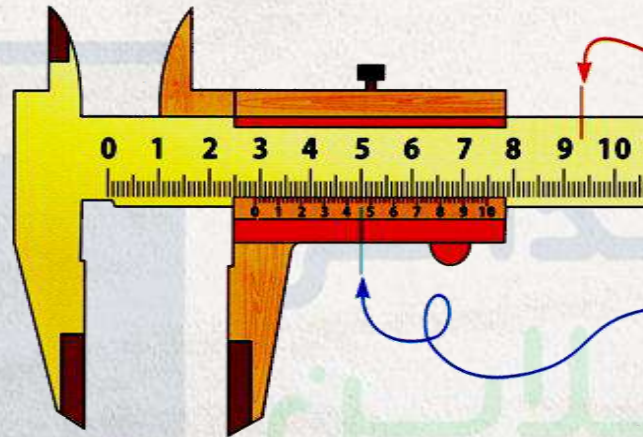
9 Types of measurement



Physical Measurement



Vernier Caliper



Fixed scale
(One division = 1 mm)

Sliding (vernier) scale
It moves along the fixed scale and it is graduated into a number of divisions (One division = 0.9 mm)

Note

The millimeter (mm) is the measuring unit of the very small lengths and it equals 10^{-3} m

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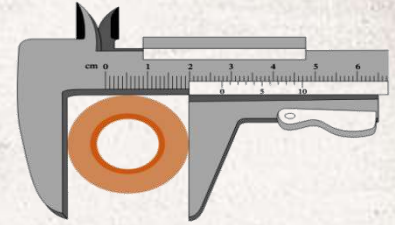
8 Measurement error

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Physical Measurement

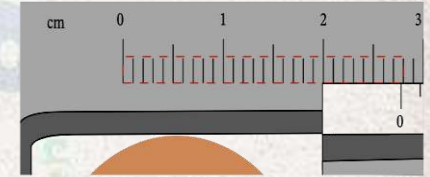


How it is used ?



1 The object is placed **between the two jaws** of the caliper and gently pressed.

2 The length of the object is determined from the relation: **The length = $X + x$**



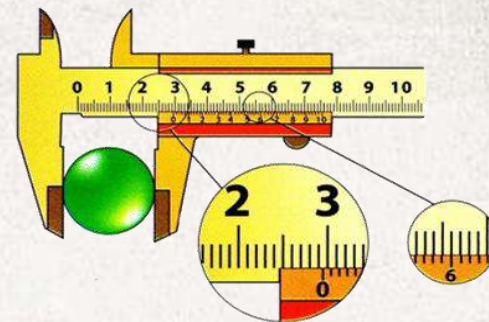
Where: (X) is the reading on the fixed scale which is recorded before the zero mark of the vernier scale

(x) is the vernier reading which is determined by finding out the mark on the Vernier scale that perfectly lines up with one of the marks on the fixed scale and multiplying it by the difference between the divisions on the fixed scale and the divisions on the vernier scale (multiplying it by 0.1 mm).



Using the opposite figure, the external diameter of the ball is

.....



- ☐ 29 mm
- ☐ 29.1 mm
- ☐ 29.6 mm
- ☐ 35 mm

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Physical Measurement



2

Mass

Roman scale



Analog scale



Beam balance



Digital balance



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Physical Measurement

Clock



Stopwatch



Digital watch



Hourglass



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Physical Measurement

Third Measuring units

► Each physical quantity, either fundamental or derived, has a measuring unit because a quantity without its unit is meaningless, **for example:**

The mass of a body = 5



(The absence of a measuring unit makes us puzzled because we can't estimate the mass)

The mass of a body = 5 kg



(The quantity is fully clarified when there is a unit of measurement).

Note

Some physical quantities have no measuring units like relative density and refractive index and that is because they are equal to the quotient of two quantities of the same kind.

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Physical Measurement



The following table shows the **measuring units** in each of the French, the British and the metric systems.

The fundamental physical quantity	The French system (Gaussian system) (C.G.S)	The British system (F.P.S)	The metric system (M.K.S)
Length	Centimeter (cm)	Foot (ft)	Meter (m)
Mass	Gram (g)	Pound (lb)	Kilogram (kg)
Time	Second (s)	Second (s)	Second (s)

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Physical Measurement

	The physical Quantity	The international Unit
	Length (L)	Meter (m)
2	Mass (M)	Kilogram (kg)
3	Time (T)	Second (s)
4	Electric current intensity (I)	Ampere (A)
1	The absolute temperature (T)	Kelvin (K)
6	Amount of Material (n)	Mole (mol)
7	Luminous intensity (I _v)	Candela (Cd)
8	The angle measure	Radian
9	The solid angle measure	Steradian

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Physical Measurement

Standard Units

► The standard meter is the distance between two engraved marks at the ends of a made of platinum and iridium alloy kept at 0°C , at the International Bureau of Weight and Measures near Paris.

1 the standard mass (The standard kilogram)

► It is used to calibrate the unit of measuring mass (**the kilogram**).

The standard kilogram is the mass of a cylinder made of platinum and iridium alloy of Sacrifice dimensions kept at 0°C , at the International Bureau of Weights and Measures near Paris.



Note

Platinum and iridium alloy is used in making standard meter and standard kilogram instead of other materials such as glass because platinum and iridium alloy is rigid, chemically inactive and not affected by the surrounding temperature contrary to the other materials.

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Physical Measurement



The standard time (The second)

Recently



Scientists use the atomic clocks such as the cesium clock to calibrate the second because of their high accuracy.

The cesium atomic clock is used for :

- Determining the duration Of the Earth spin (the day length).
- Tuning up the clocks used for aviation and navigations.
- Synchronizing the devices used in space ships that explore the universe.



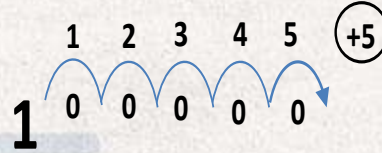
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Physical Measurement



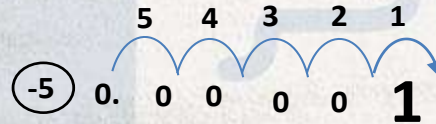
Quantity



Standard formula

$$1 \times 10^5$$

Quantity



Standard formula

$$1 \times 10^{-5}$$

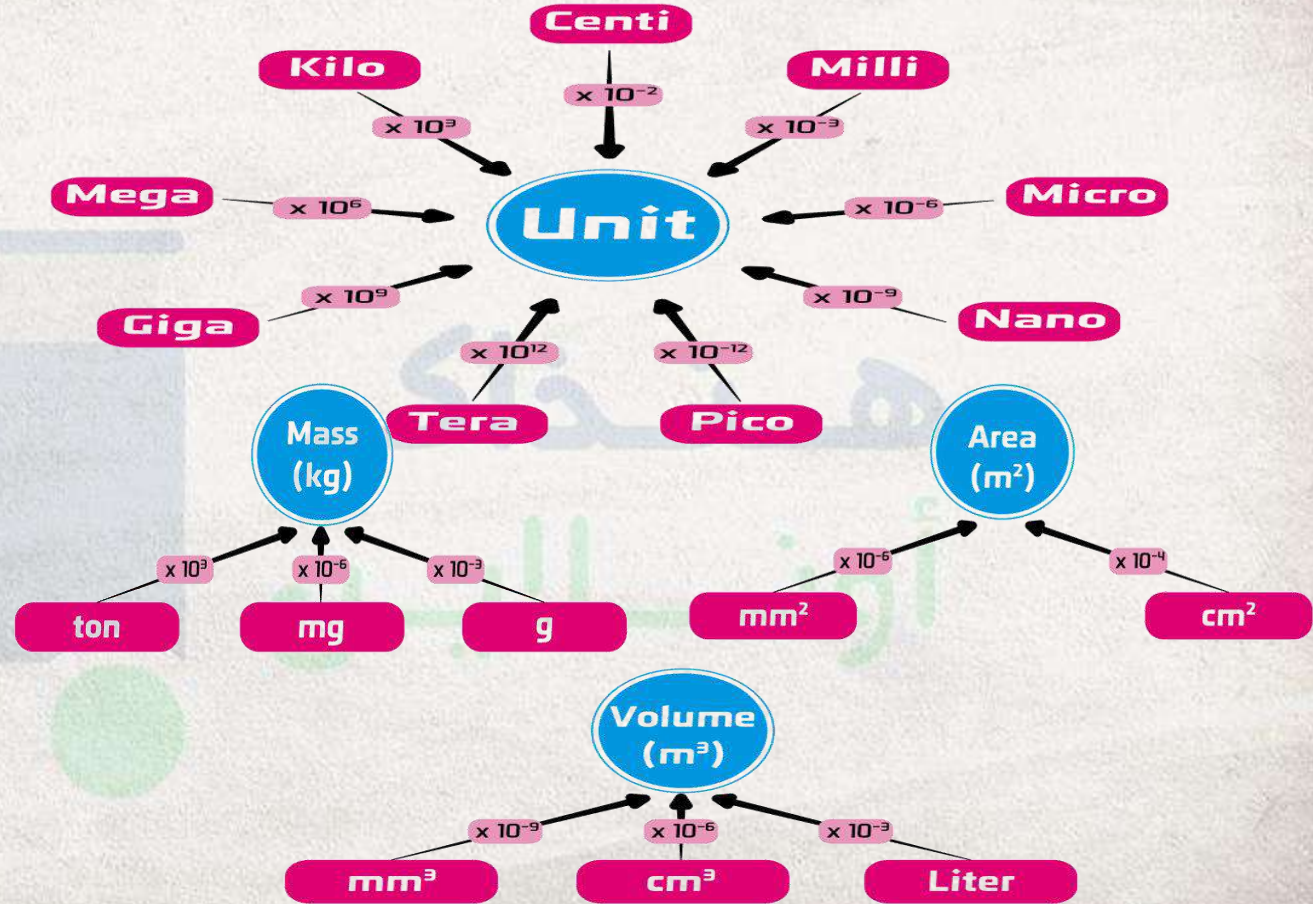
Remember

$$\begin{aligned} 10^5 \times 10^{-4} &= 10^{5+(-4)} = 10 \\ &= 10^{5-4} = 10^1 \end{aligned}$$

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Physical Measurement



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Physical Measurement

Dimensional formula

Most of the derived physical quantities can be expressed in terms of the dimensions of the fundamental physical **quantities**

which are:

1 Mass "M"

2 Length "L"

3 Time "T"

Accordingly, any physical quantity [X] can be expressed by the following general formula: $[X] = M^{\pm a} L^{\pm b} T^{\pm c}$

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Physical Measurement

Remarks

To add or subtract two physical quantities, they must :

- A** Be of the same kind such as mass and mass or velocity and velocity.
- B** Have the same dimensional formula such as (M and M) or (LT^{-1} and LT^{-1}).
- C** Have the same units such as (cm and cm) or (J and J).

(G.R) Velocity can not be added to force

- You can not add two physical quantities unless they have the same dimensions.
- The dimensional formula of velocity is LT^{-1} , while that of force is MLT^{-2}

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Physical Measurement



The following table shows the dimensional formulae of some derived physical quantities:

The physical quantity	Its relation to other quantities	The dimensional formula	Unit of measurement
Area	$A = \text{Length} \times \text{width}$		m^2
Volume	$V = \text{length} \times \text{width} \times \text{height}$		m^3
Density	$\rho =$		Kg/m^3
Velocity	$V =$		m/s
Acceleration	$a =$		m/s^2
Force	$F = \text{mass} \times \text{acceleration}$		$\text{Kg. m}/\text{s}^2$ Newton (N)
Work	$W = \text{force} \times \text{displacement}$		$\text{Kg. m}^2. \text{S}^{-2}$ Joule (J)

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Physical Measurement

The Importance of the dimensional formula

The dimensional formula can be used to verify the validity of a physical relation. When applying the dimensional analysis, dimensions of both sides of the equation should match

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Physical Measurement



Types of measurement & Measurement error

Direct measurement

- **One measuring** tool is used.
- **One measurement** process is performed.
- **No mathematical** relation is applied.
- **One measurement** error may occur.



Example



1 **Measuring liquid density** using the hydrometer.

2 **Measuring volume** using the graduated cylinder.

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Physical Measurement



Types of measurement & Measurement error

Indirect measurement

- **More than one** measuring tool are used.
- **More than one measurement** process are performed.
- **A mathematical relation** is applied to find the quantity
- **More than one measurement** error may occur. “error accumulation”.



Example



- 1 **Determining the liquid density** via measuring mass by a balance and volume by a graduated cylinder. Then, dividing mass by volume
- 2 **Measuring volume** by multiplying length, width and height

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Physical Measurement

Types of measurement & Measurement error

Reasons of measurement error

1 Choosing improper tool

2 A Defect in the measuring tool

3 Wrong procedure

4 Environmental conditions

Chapter (2)

Motion in a Straight Line



1

Motion

2

Types of motion

3

Velocity (v)

4

speed and the velocity

5

Types of Velocity

6

Acceleration

7

Types of acceleration



motion in a Straight Line



Motion

The change in the position of an object relative to a fixed point as time passes.



1

Motion

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Types of motion

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Velocity (v)

4

speed and the velocity

5

Types of Velocity

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Acceleration

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Types of acceleration



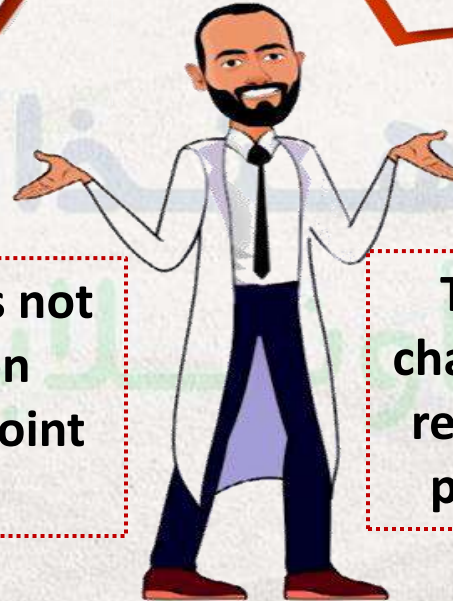
motion in a Straight Line



Objects around us can be

Static objects

Moving object



The object that does not change its position relative to a given point with time.

The object that changes its position relative to a given point with time.

1 Motion

2 Types of motion

3 Velocity (v)

4 speed and the velocity

5 Types of Velocity

6 Acceleration

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motion in a Straight Line

Types of motion

Translational motion

It's the motion that has starting point and ending point

1 motion in straight-line

2 motion in curved path (projectile motion)



Periodic motion

It's the motion that repeats itself regularly in equal intervals of time. Periodic motion can be classified into:

1 oscillatory motion

2 Circular motion



1 Motion

2 Types of motion

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4 speed and the velocity

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motion in a Straight Line

Types of motion

If a car moves to cover a distance in a certain direction (displacement) Δd in time interval Δt , the car velocity (v) can be found

by the relation:
$$v = \frac{\Delta d}{\Delta t} = \frac{d_2 - d_1}{t_2 - t_1}$$

1 Unit of measuring velocity: m/s or km/h.

2 Dimensions of velocity : $L T^{-1}$

3 You can convert the unit of measuring velocity from km/h into m/s as follows:

$$1 \text{ km/h} = \frac{1 \text{ km}}{1 \text{ h}} = \frac{1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{5}{18} \text{ m/s}$$

1 Motion

2 Types of motion

3 Velocity (v)

4 speed and the velocity

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motion in a Straight Line

Speed



velocity



So we can say that :

Speed
+
direction

→ Velocity

1

Motion

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Types of motion

3

Velocity (v)

4

speed and the velocity

5

Types of Velocity

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Acceleration

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Types of acceleration



motion in a Straight Line



Speed

The distance moved by the object per unit of time. Scalar quantity: defined by its magnitude only. Always positive

Velocity

The displacement of the object per unit of time

Vector quantity: defined by its magnitude and direction.

Positive in a certain direction and negative in the opposite direction.

1

Motion

2

Types of motion

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Velocity (v)

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speed and the velocity

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Types of Velocity

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Acceleration

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Types of acceleration



motion in a Straight Line



Velocity

Non-uniform

Uniform

Average

Instantaneous



1 Motion

2 Types of motion

3 Velocity (v)

4 speed and the velocity

5 Types of Velocity

6 Acceleration

7 Types of acceleration

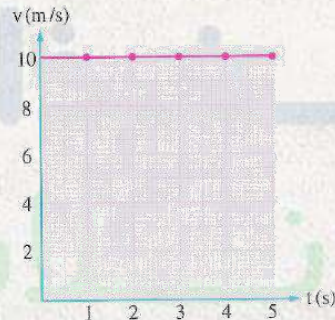
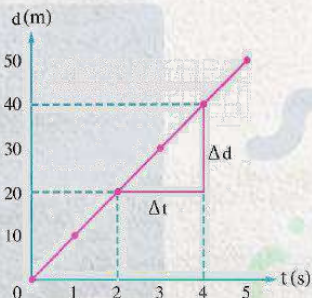


motion in a Straight Line



Uniform velocity

The **velocity** by which the object moves through equal displacements in equal intervals of time, where the object moves at a velocity of constant magnitude in one direction (**straight line**).



The car covered equal displacements in equal intervals of time, so the car is moving with a **uniform (constant) velocity** of magnitude 10m/s .

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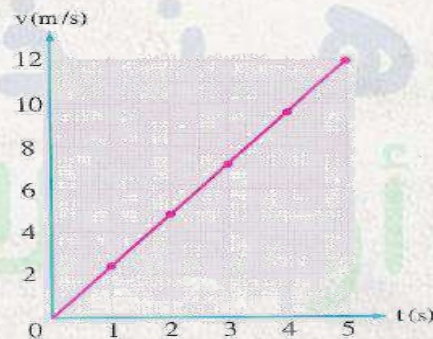
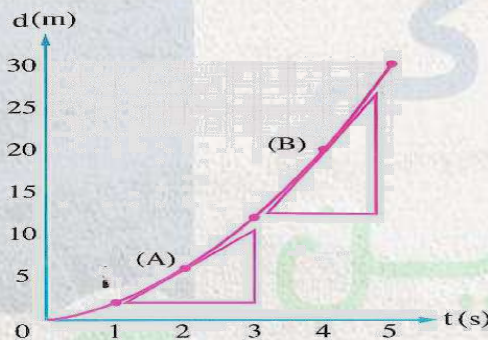


motion in a Straight Line



Non-uniform velocity

The velocity by which the object moves through un equal displacements in equal intervals of time, where the velocity changes its magnitude or direction or both of them.



The car covered unequal displacements in equal intervals of time, so the car is moving with non-uniform velocity.

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motion in a Straight Line



When the object moves at a uniform or non-uniform velocity:

1

The velocity of the object at a certain instant is called the instantaneous velocity (v).

2

The average of the body's velocity during a certain interval of time called the average velocity (v).

Instantaneous velocity (v)

The velocity of the object at a given instant

Average velocity

(v_{av})

The total displacement of the object from the starting point to the end point divided by the total time of motion

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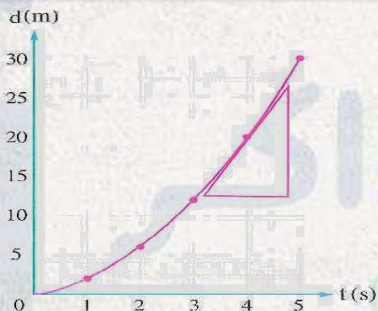
motion in a Straight Line



Graphical representation

1

Instantaneous velocity (v)

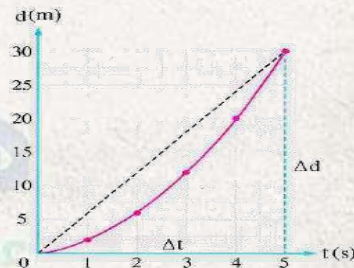


The instantaneous velocity of an object is given by the slope of the tangent drawn to the curve at the point corresponding to that instant.

$$\text{Slope of tangent} = v = \frac{\Delta d}{\Delta t} = \frac{26.5 - 12.5}{4.8 - 3.2} = 8.8 \text{ m/s}$$

2

Average velocity (v)



The average velocity of an object is given by the slope of the line joining the starting point and the end point. Slope of tangent = $\frac{\Delta d}{\Delta t} = \frac{30 - 0}{5 - 0} = 6 \text{ m/s}$

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Note



1 The average velocity differs from the average speed where:

$$\text{Average velocity} = \frac{\text{Total displacement}}{\text{Total time}}$$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

Average velocity is a vector quantity.

2 Instantaneous velocity equals average velocity when the object moves by a uniform velocity in a straight line.

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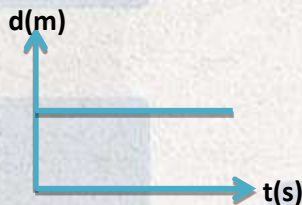
7 Types of acceleration

motion in a Straight Line

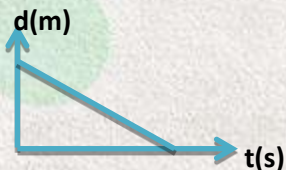
Note



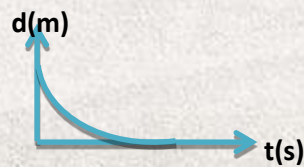
- 3 A body at rest is represented graphically in the displacement (d) – time (t) graph by a straight line parallel to the time axis (slope = 0).



- 4 If the object was moving towards a fixed point, then the graphical relation between the displacement of the object from the point (d) and time (t) becomes:



The object is moving with a uniform velocity



The object is moving with a non-uniform velocity

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Note



- 5 The displacement covered by a body can be determined from the (velocity – time) graph that describes the motion of the body, where:
The displacement = The area under the (velocity – time) curve

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Acceleration

The acceleration can be found by the relation:

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time of change}} = \frac{\text{Final velocity} - \text{Initial velocity}}{\text{Final time} - \text{initial time}}$$

$$a = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$

The unit of measuring acceleration is **m/s²** or **km/h²** and its dimensional formula is **LT⁻²**

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5 Types of Velocity

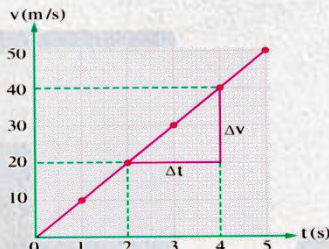
6 Acceleration

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motion in a Straight Line

Graphical representation

Uniform acceleration

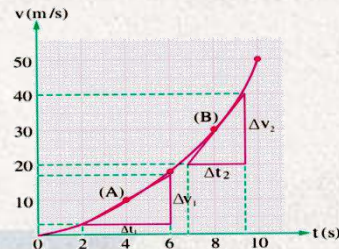


The slope of the straight line gives the uniform acceleration by which the object moves.

Slope of line =

$$\frac{\Delta v}{\Delta t} = \frac{40 - 20}{4 - 2} = 10 \text{ m/s}^2$$

Non_uniform acceleration



The slope of the tangent drawn to the curve at any point gives the instantaneous acceleration of the object at this point.

The acceleration at $t = 4s$

$$\text{Slope at (A)} = a_{(A)} = \frac{\Delta v_1}{\Delta t_1} = \frac{17 - 3}{6 - 2} = 3.5 \text{ m/s}^2$$

The acceleration at $t = 8$

$$\text{Slope at (A)} = a_{(B)} = \frac{\Delta v_2}{\Delta t_2} = \frac{40 - 20}{9.4 - 6.8} = 7.69 \text{ m/s}^2$$

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motion in a Straight Line

This means that

The velocity of the object changes with equal amounts in equal intervals of time and this is called uniform acceleration.

The velocity of the object changes with unequal amounts in equal intervals of time and this is called non-uniform acceleration (changeable acceleration).

If we assume that the velocity of an object is positive, its acceleration may be

- 1 Positive (increasing velocity).
- 2 Equal zero (uniform velocity).
- 3 Negative and in this case it is called deceleration (decreasing velocity).

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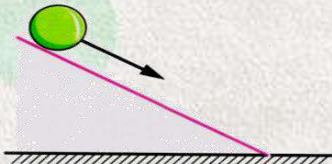
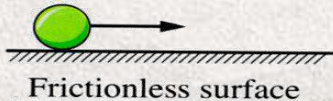
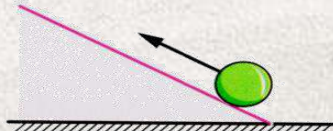
7 Types of acceleration



motion in a Straight Line



This means that

(1) Positive acceleration	(2) Zero acceleration	(3) Negative acceleration
It is the acceleration of the object when its velocity increases with time.	It is the acceleration when the velocity of the object is constant with time	It is the acceleration of the object when its velocity decreases with time.
		

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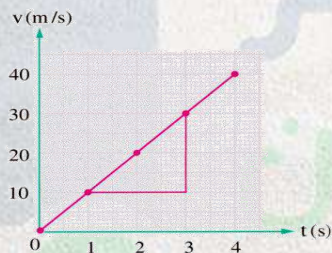
motion in a Straight Line



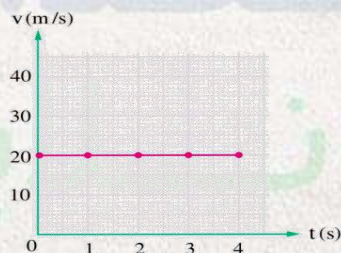
Graphical representation

When plotting the graphical relationship of **(velocity - time)**, we may get :

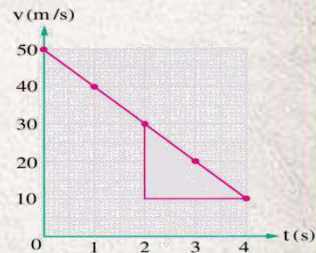
A straight line that
may start from the
origin



A straight line
parallel to the time
axis



A straight line that may
end at the time axis



By finding the slope of the straight line, we obtain the acceleration of the object motion :

Slope of line = $a =$

Slope of time = $a = 0$

Slope of line = $a =$

1 Motion

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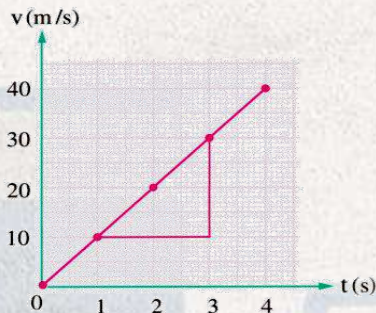
5 Types of Velocity

6 Acceleration

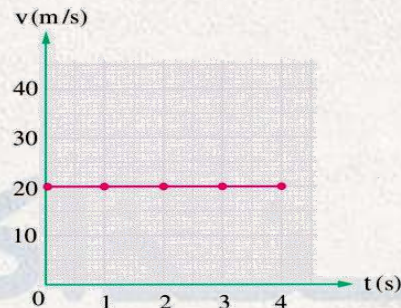
7 Types of acceleration

motion in a Straight Line

This means that



The velocity of the object increases with time, so the object moves with uniform positive acceleration of 10 m/s^2 .



The velocity of the object is uniform (constant) with time, so the object moves with no acceleration (zero acceleration).



The velocity of the object decreases with time, so the object moves with uniform negative acceleration of -10 m/s^2 .

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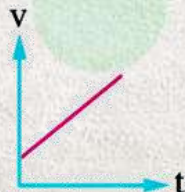
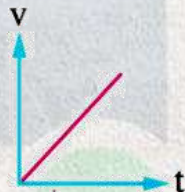
motion in a Straight Line

This means that

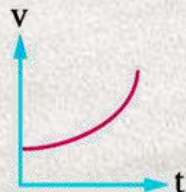
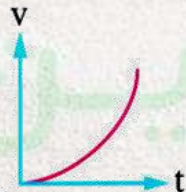
Graphical representation for the **(velocity-time)** curve

When the acceleration is

Uniform

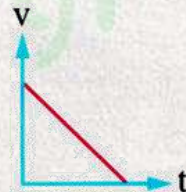


Non-Uniform

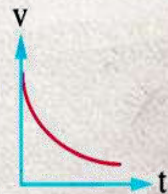
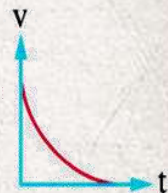


When the acceleration is

Uniform



Non-Uniform



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motion in a Straight Line

Guidelines to solve problems

- 1 If the **object** moves at uniform velocity, its acceleration of motion = zero because the change in velocity (Δv) = zero.
- 2 When the **object** starts motion from rest, its initial velocity (V_i) = zero and when the object comes to rest, its final velocity (V_f) = zero.
- 3 If the **object moves** in a straight line with uniform acceleration, its average velocity is given from the relation:
$$v = \frac{v_i + v_f}{2}$$
- 4 If the driver applies the brakes till the car stops, its final velocity (v_f) = zero.

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Guidelines to solve problems

- 5 When the final velocity (v_f) $>$ the initial velocity (v_i), the acceleration is positive (**Increasing velocity**).
- 6 When the final velocity (v_f) $<$ the initial velocity (v_i), the acceleration is negative (decreasing velocity).
- 7 When the final velocity (v_f) $=$ the initial velocity (v_i), the acceleration is zero (uniform velocity).
- 8 If the velocity and acceleration have the same direction then have the same sign (**accelerating motion**).
- 9 If the velocity and acceleration have opposite directions then they have opposite signs (**decelerating motion**).

Chapter (3)

Force and Motion

The background of the slide is a painting of three horses galloping across a field. The horses are in various shades of brown and tan, with their manes and tails flowing. The ground is a mix of yellow and brown, suggesting a dusty or grassy field. The overall style is painterly and dynamic, capturing the motion of the horses.

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Force

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Newton's first law

3

Inertia

4

Momentum

5

Newton's second law

6

acceleration of
a body's motion

7

Newton's third law



Force and Motion



Force

It is the external influence that affects an object to change its state of motion or direction.

Examples

- The force of the car engine helps the car to start our moving or to increase its velocity.
- The force of brakes acts to stop the moving car.
- The friction is the force that resists motion when the surface of one object comes in contact with the surface of another.
- Invisible forces that work all around us like gravity, electromagnetism and nuclear forces.



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Force and Motion

**First: Newton's first law****Explanation of Newton's first law:**

1

When a ball is placed on the ground, it remains stationary in its position unless the player acts on it and changes its state (It doesn't change its state unless acted upon by an external force).



The static body stays at rest



The static body moves when an external force acts on it

2

When the ball is kicked on the ground, it rolls for a certain distance, then slows down till it stops by the effect of frictional forces between the ball and the ground that resist the rolling of the ball (friction is an external force that acts to change the object's state).



The moving body stops when an external force acts on it (frictional force)

If these frictional forces do not exist, the ball would keep moving at a uniform velocity in a straight line and would not stop.

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Force and Motion

Newton's first law of motion

"A static object keeps its state of rest and a moving object keeps its state of motion at a uniform velocity in a straight line unless acted upon by a resultant force that changes its state".

$$\Sigma \vec{F} = 0$$

The mathematical formula that expresses Newton's first law:

The symbol (Σ) is pronounced sigma and it means "resultant"

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Force and Motion



Inertia

► Inertia can be clarified by the following **examples**:

The coin gets dropped into the cup when the card is rapidly flicked,



because the static body (**coin**) tends to keep its state of rest.

The motorcyclist is thrown forwardly when the motorcycle collides with a barrier,



because the moving object (**motorcyclist**) tends to keep its state of motion.

The continuity of the fan motion for an interval of time when the electric current is turned off,



because the moving object (**blades of the fan**) tends to keep its state of motion.

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Force and Motion



Inertia

► Inertia can be clarified by the following **examples**:

When a bus moves forward suddenly from rest or when its increases suddenly, the passengers tend to fall backward,



because the body **(passengers)** tends to keep its state of rest.

When the bus stops suddenly or when its velocity decreases suddenly, the passengers tend to fall forward,



because the body **(passengers)** tends to keep its state of motion.

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Inertia

Force and Motion

It is the tendency of an object to keep either its state of rest or state of motion at its original velocity uniformly in a straight line.

Or It is the property of objects to resist the change of its static or dynamic state.

Note

- 1- Newton's first law is known as the law of inertia because the object can't change its state of rest or motion in a straight line with a uniform velocity by itself
- 2- Seatbelt should be fastened when driving to reduce the effect of inertia during car crashes and protect passengers from being hurt.
- 3-Space rockets do not consume fuel to keep moving when being out from the Earth's gravity because inertia keeps them moving at a uniform velocity in a straight line

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Force and Motion



The velocity (**v**) and the mass (**m**) are related to a physical quantity known as momentum (**p**) which is given by the relation : **$P = mv$**

The measuring
unit

o
f

momentu
m

is

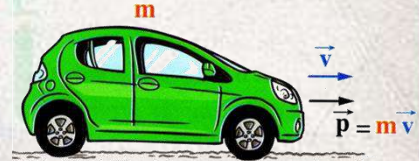
Kg.m/s

and its
Dimensional
formula is

MLT^{-1}

Note

1 Momentum is a vector quantity



because it is the product of a scalar quantity (**mass**) and a vector quantity (**velocity**) and its direction is in the same direction of the velocity.

1 Force

2 Newton's first law

3 Inertia

4 Momentum

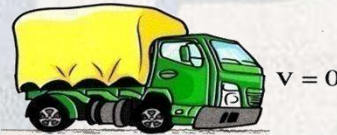
5 Newton's second law

6 acceleration of
a body's motion

7 Newton's third law

Note2 According to the relation ($p = mv$), then the:**Momentum**

For a static body equals
zero regardless the
increase of its mass,



Because the velocity of
the static body equals
zero.

$$\therefore P = m \times 0 = 0$$

For a moving body doesn't
equal zero regardless the
decrease of its mass.



Because the velocity of
the moving body
doesn't equal zero, so
its momentum doesn't
equal zero.

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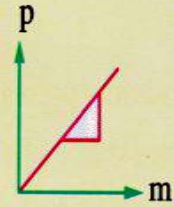
Force and Motion

The factors that affect / momentum:

1 Mass :

The momentum is directly proportional to the mass of the object at constant velocity.

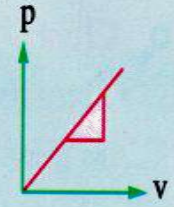
$$\text{Slope} = \frac{\Delta p}{\Delta m} = v$$



Velocity :

The momentum is directly proportional to the velocity of the object at constant mass.

$$\text{Slope} = \frac{\Delta p}{\Delta v} = m$$



$$p = mv$$

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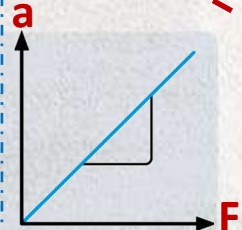
7 Newton's third law

$$\text{Slope} = \frac{\Delta a}{\Delta F} = \frac{1}{m}$$

Define

The resultant force equal to the rate of change in momentum

Graph



Factors

mass (m)

acceleration (a)

Rate of change of momentum ($\frac{\Delta p}{\Delta t}$)

Newton's second law

Type of quantity

Measuring unit

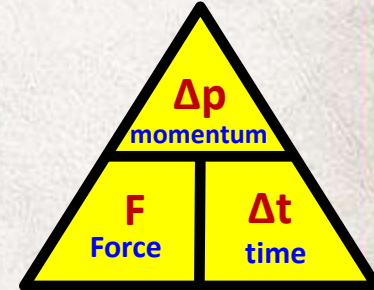
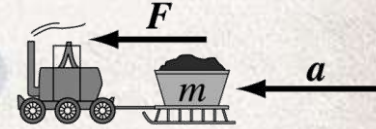
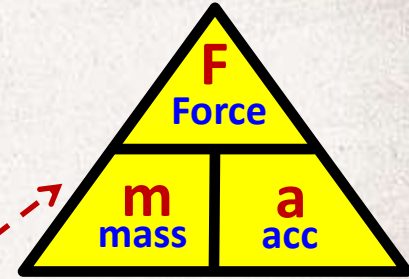
Vector quantity

$\text{Kg} \cdot \text{m/s}^2$

Dimensional formula

MLT^{-2}

Relation



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Newton's third law

Newton's second law

$$F = ma$$

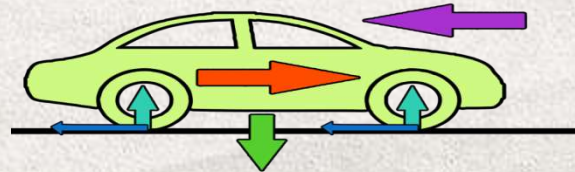
$$\frac{F_1}{F_2} = \frac{m_1 a_1}{m_2 a_2}$$

$$\frac{m_1}{m_2} = \frac{F_1 a_2}{F_2 a_1}$$

$$\frac{a_1}{a_2} = \frac{F_1 m_2}{F_2 m_1}$$

$$F = m \frac{v_f - v_i}{t}$$

$$F_{\text{moving}} = F_{\text{acting}} - F_{\text{friction}}$$



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Inertia

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Newton's third law

Force and Motion

Newton's third law of motion

"When an object acts on another object by a force, the second object reacts with an equal force on the first object in a direction opposite to that of action".

Or "For every action there is a reaction equal in magnitude and opposite in direction".

The mathematical formula that expresses the Newton's third law:

$$\vec{F}_1 = -\vec{F}_2$$

(The negative sign indicates that the two forces $\vec{F}_1$ and $\vec{F}_2$ act in opposite directions).

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Force and Motion



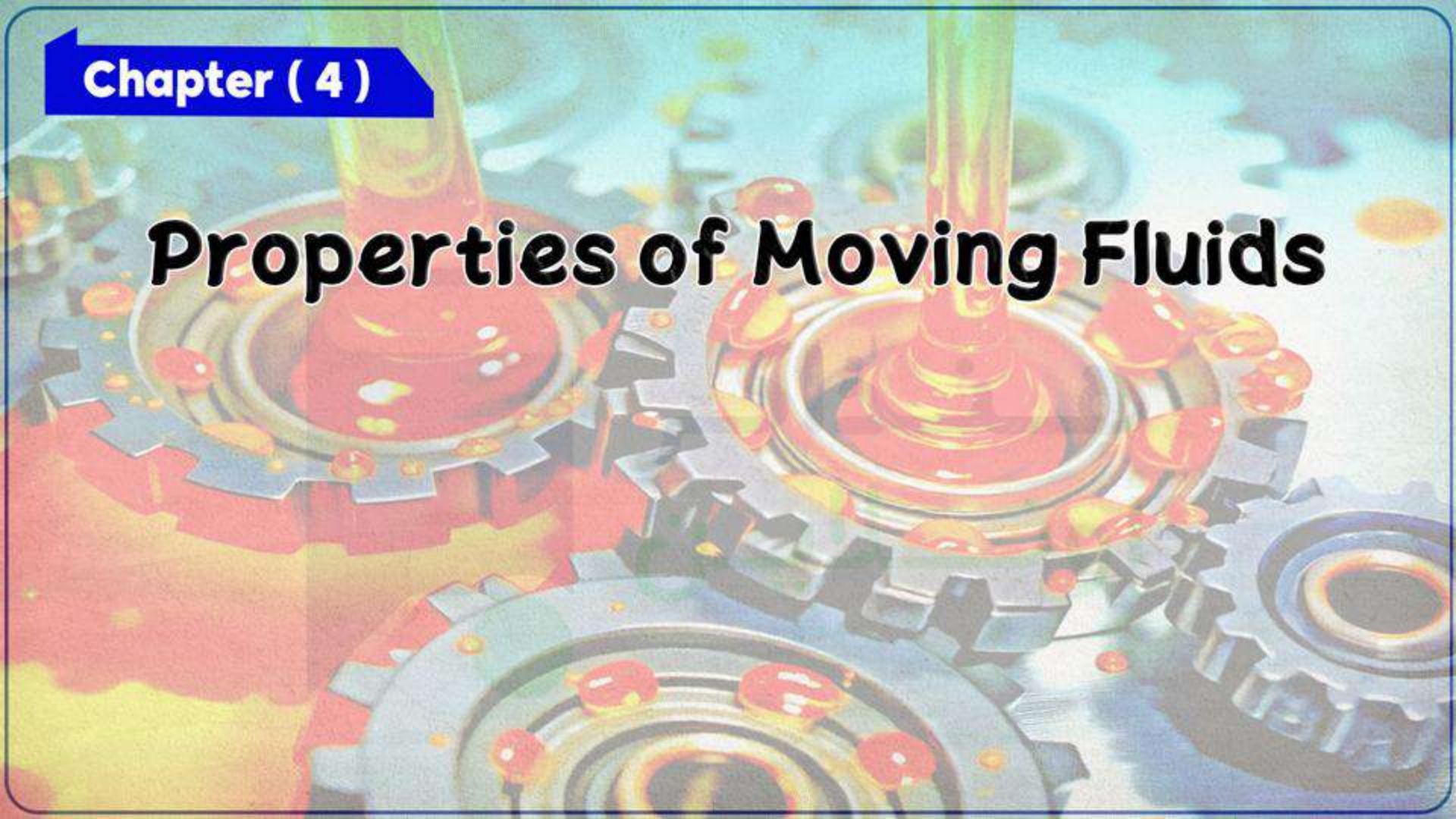
Note

- 1 **No single force can exist in the universe** because action and reaction are paired force: originate and vanish together.
- 2 Although action and reaction forces are equal, they do not have to be at equilibrium (**the resultant of the action and the reaction $\neq$ zero**) because the two forces act on different bodies and the equilibrium condition happens when the two equal forces act on the same body.
- 3 Action and reaction are of the same type; if the action is a gravitational force, reaction is a gravitational force, as well.
- 4 The action force and the reaction may not be perpendicular on the surface as in the opposite figure.



Chapter (4)

Properties of Moving Fluids



- 1 States of matter
- 2 Fluid
- 3 Density
- 4 relative density
- 5 Flow
- 6 Flow rate
- 7 Continuity equation
- 8 Viscosity
- 9 Viscosity co-efficient
- 10 Tangential force
- 11 Application of viscosity

Properties of Moving Fluids

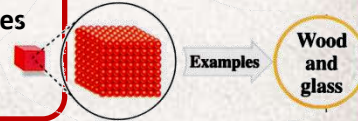


The states of matter

Matter can be found in one of three states

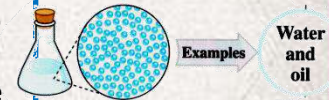
Solid state

In which molecules are tightly packed (the spaces between them are very small) and they are locked into their places in a regular pattern due to the existence of very strong intermolecular forces of attraction among them so a solid has definite shape and volume



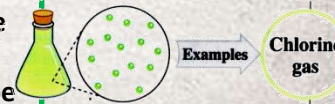
Liquid state

In which molecules are close together with no regular arrangement and they can move and slide past each other where the intermolecular attraction forces among them are relatively average, so a liquid doesn't have a definite shape and it takes the shape of its container, so it is called a **fluid**



Gas state

In which molecules are separated by relatively large spaces with no regular arrangement and they move freely at high speeds due to the absence of the intermolecular forces of attraction among them, so a gas doesn't have a definite shape but it takes the shape of its container, so it is called a **fluid**



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Properties of Moving Fluids



The states of matter

Fluid

It is a substance that flows and doesn't have a fixed shape but it takes the shape of its container **Fluids are two types :**

1 Liquids

2 Gases

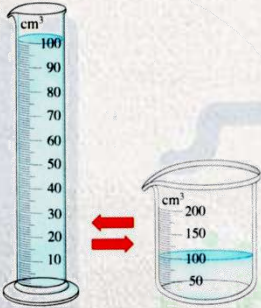
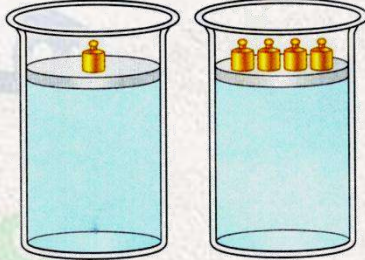
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Properties of Moving Fluids



1 Liquids

Having a definite volume	Having the capacity to flow	Being incompressible
 Notice that the volume of the water remains constant while it takes the shape of its container	 Notice that the flow of water is from a higher level to a lower level	 Notice that the volumes of water in the two cups are equal despite the change in pressure resulting from the weight of the loads acting on the movable pistons

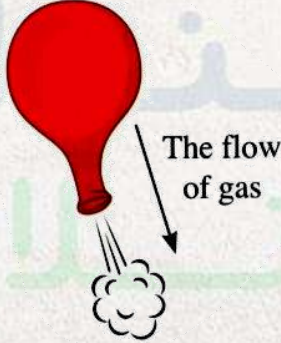
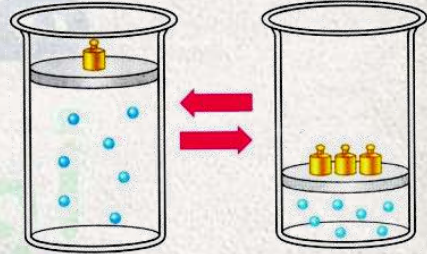
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Properties of Moving Fluids



2 Gases

Occupying and taking any shape of space as their containers	Having the capacity to flow	Being compressible
		
Notice that the gas occupies the space of the balloon and takes its shape	Notice that the flow of gas is from higher pressure to lower pressure	Notice that the volume of the gas changes with changing the pressure caused by the weight of the loads acting on the movable pistons.

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Density

Properties of Moving Fluids

Definition

The mass of a unit volume of the material.

Mathematical relation

$$\frac{m}{V_{ol}}$$

Dimensional formula

$$= \frac{M}{L^3} T^0$$

SI measuring unit

$$Kg/m^3$$

Type of quantity

Scalar quantity

factors

It depends on:

1. The atomic mass of the element or the molecular mass of the compound.
2. The distances between atoms (interatomic distances) or molecules (intermolecular spaces)

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Properties of Moving Fluids



Relative density

It is the ratio of the density of the material at a given temperature to the density of water at 4°C . **Or** It is the ratio of the mass of a certain volume of the material at a given temperature to the mass of the same volume of water at 4°C .

Hence, the relative density of a substance (solid or liquid) can be determined from

The relative density of a material

$$= \frac{\text{The density of the material at a definite temperature}}{\text{The density of water at } 4^{\circ}\text{C.}}$$

$$= \frac{\text{The mass of certain volume of the material at a definite temperature}}{\text{The mass of the same volume of water at } 4^{\circ}\text{C.}}$$

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Properties of Moving Fluids

1

Detection of the charge level of the car batteries by measuring the density of the electrolytic solution where, during

Discharging

The density of the electrolytic solution (diluted sulphuric acid) decreases due to being consumed in its chemical reaction with the lead plates which forms lead sulfate and water.

Charging

The sulfate ions get liberated from the lead plates and go back into the solution where the density of the solution increases to reach its original value.

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Properties of Moving Fluids



Life applications

2 Diagnosis of some diseases, like

The increase of salts concentration in urine	The decrease of red blood cells concentration	The increase of red blood cells concentration
By measuring urine density	By measuring blood density	By measuring blood density
Where :Normal urine density is about 1020 kg/m ³ Some diseases increase the concentration of salts in urine which increases its density above the normal value	Where :Normal blood density ranges from 1040 kg/m ³ to 1060 kg/m ³	
	The blood density gets decreased below 1040 kg/m ³ , it indicates that red blood cells concentration is low, which indicates anemia.	The blood density gets increased above 1060 kg/m ³ , it indicates that red blood cells concentration is high.

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Properties of Moving Fluids

A fluid is the material that can flow and has no definite shape like liquids and gases. In this chapter, we will study two properties of the moving fluids which are :

Flow

Viscosity

The flow of liquids are classified into two types :

Steady flow

Turbulent flow

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Properties of Moving Fluids

1 Steady flow

When a liquid moves such that its adjacent layers slide smoothly over each other, we describe this motion as a laminar flow or a streamline (steady) flow where every small amount of the liquid follows a continuous path called streamline.

Characteristics of streamlines

- ▶ They are imaginary lines that do not intersect.
- ▶ The number of streamlines at any cross-section of the tube is constant.
- ▶ The tangent at any point along the streamline determines the direction of the instantaneous velocity of a small amount of the liquid at that point.



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Properties of Moving Fluids

Flow rate

The quantity of the liquid that flows through a definite cross-sectional area of a tube in one second is known as flow rate and it can be expressed as :

	Volume flow rate (Q_v)	Mass flow rate (Q_m)
It is Defined as	The volume of liquid that flows steadily through a definite cross-section of a tube in one second.	The mass of liquid that flows steadily through a definite cross-section of a tube in one second
It is measured in	m^3/s	Kg/s

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Properties of Moving Fluids

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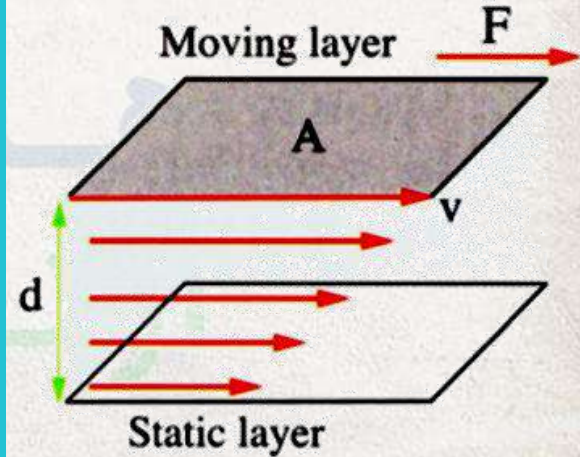


Properties of Moving Fluids



Deducing the viscosity coefficient :

Consider two layers of liquid such that the perpendicular distance between them is d , if a tangential force F acts on the upper layer of the liquid (its area A) to move it with a velocity v , then in order to make the moving layer keeps its velocity constant, then the tangential force acting on the upper layer must equal the frictional forces between the liquid layers (force of viscosity). This force is:



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Properties of Moving Fluids

The factors affecting the viscosity coefficient

- 1 The type of the fluid.
- 2 The temperature of the fluid (the fluid viscosity decreases by increasing the temperature)

The factors affecting the force of viscosity

$$F = \eta_{vs} \frac{A v}{d}$$

Measuring unit of the viscosity coefficient is N.s/m^2 and it's equivalent to kg/m.s or Js/m^3

Properties of Moving Fluids

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Properties of Moving Fluids

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Properties of Moving Fluids

Applications of viscosity

Lubrication of machines

- Machines should be lubricated from time to another, to decrease the heat produced due to friction and to protect the machine parts from corrosion and increase its efficiency



- Highly viscous oils are used due to their strong adhesive forces with the machine parts so they do not seep away or sputter from the machine parts during motion.

*

Note

it has low viscosity, so it seeps away from Water cannot be used in lubrication because the machine parts due to the weak adhesive force with the machine parts

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Properties of Moving Fluids

Applications of viscosity

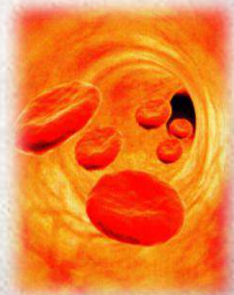
In medicine, blood precipitation rate test

(The terminal velocity of falling of the red blood cells in plasma)

- When a ball undergoes a free fall in a liquid, it is affected by three forces :

- Its weight.
- Buoyancy (upthrust force) of the liquid.
- Friction between the ball and the liquid due to viscosity.

- It is found that such ball attains a terminal velocity which depends on its radius. So, by taking a blood sample and measuring its precipitation rate, the size of red blood cells can be tested if it is normal or not.



مراجعة

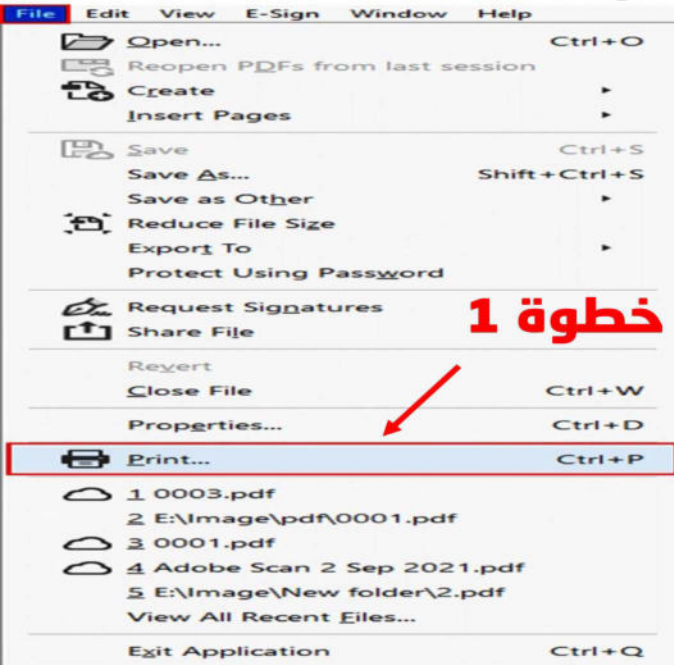
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Physics

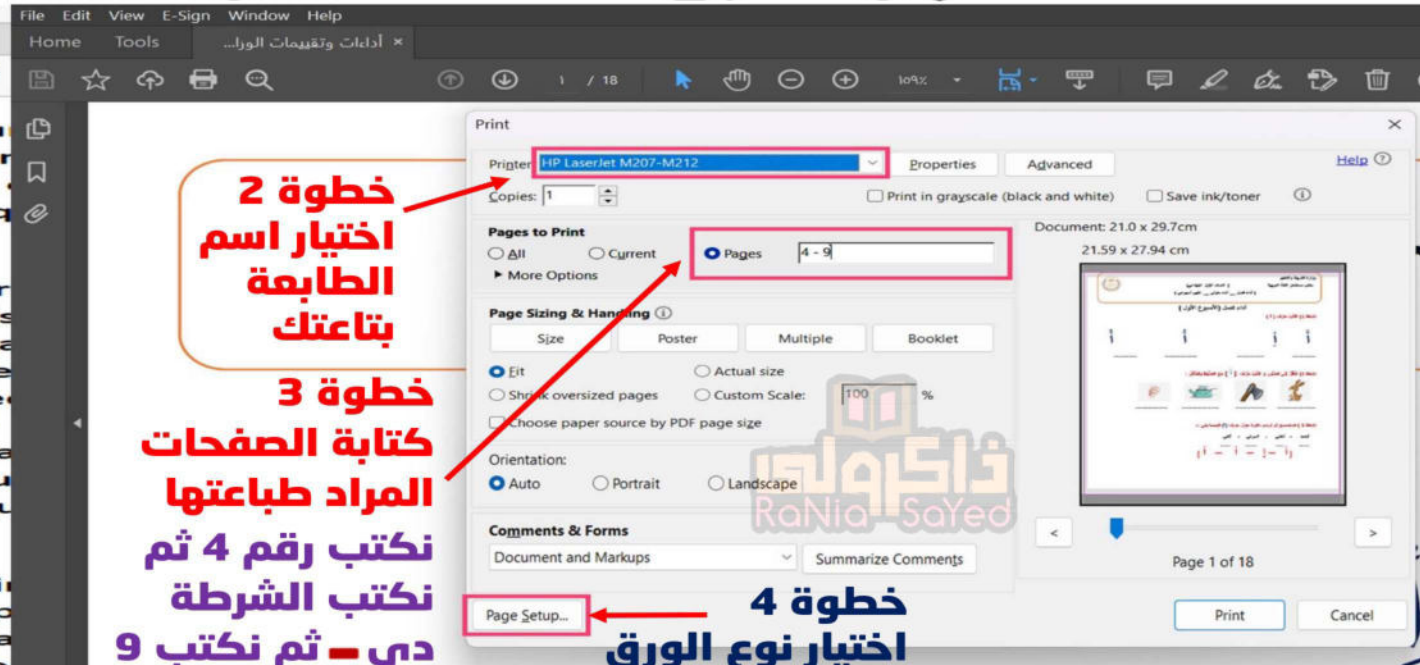


م / يوسف رائد

كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9



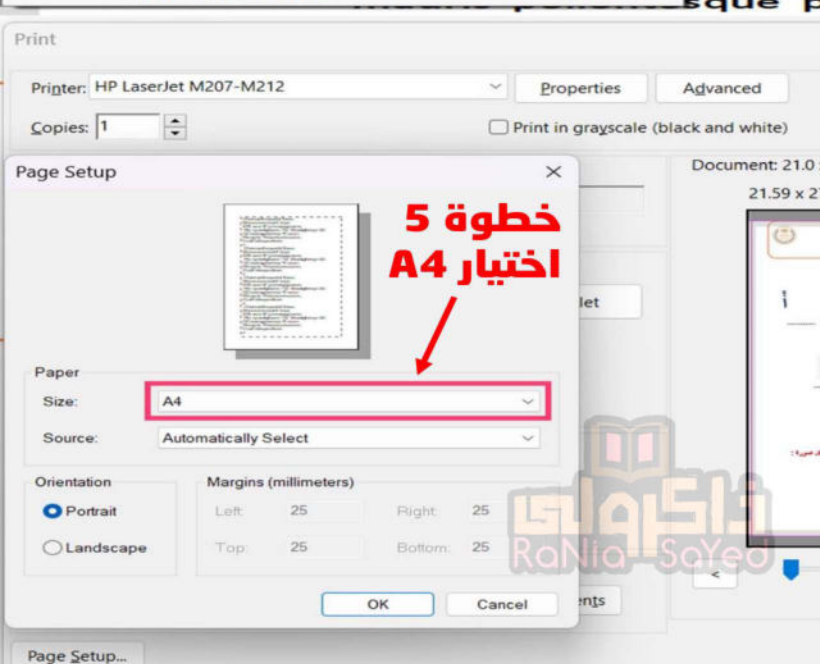
خطوة 1



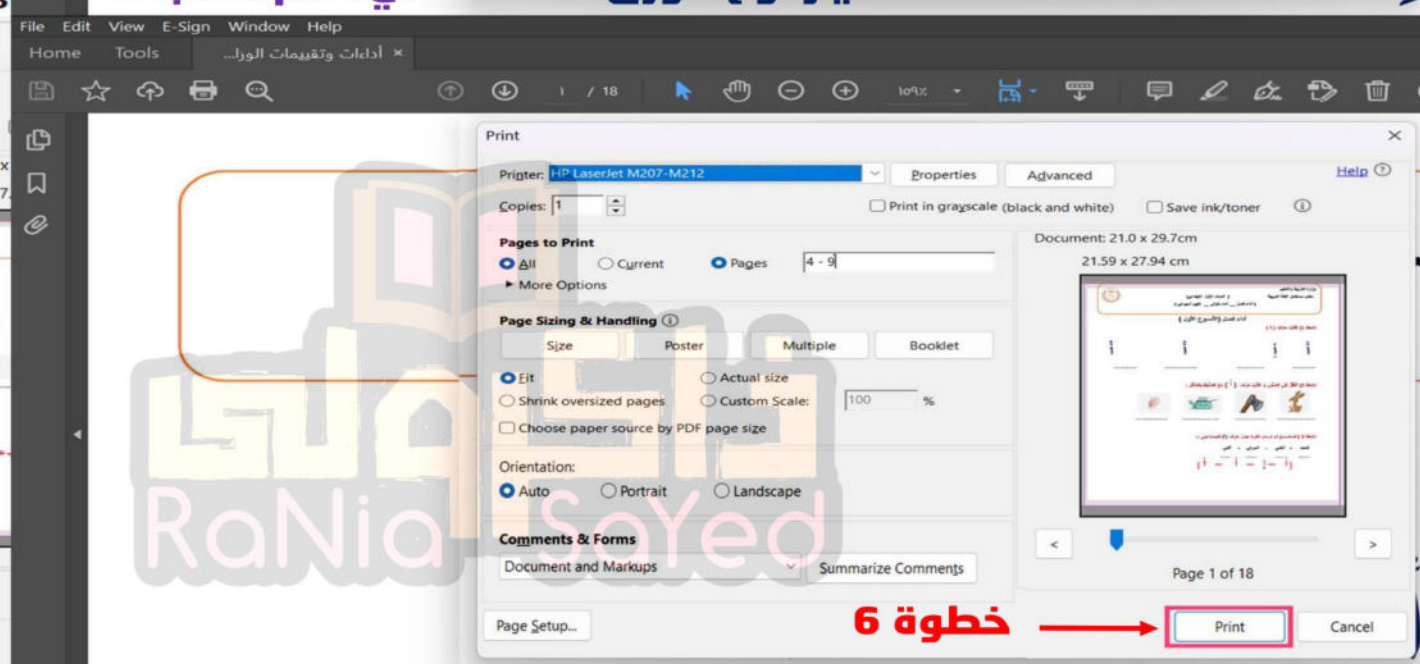
خطوة 2
اختيار اسم
الطابعة
بتاعتك

خطوة 3
كتابة الصفحات
المراد طباعتها
نكتب رقم 4 ثم
نكتب الشرطة
دي - ثم نكتب 9

خطوة 4
اختيار نوع الورق



خطوة 5
اختيار A4



خطوة 6

حمل الآن

مجاناً وحصرياً

المراجعة رقم (2)

الترم الاول



الإدارة المركزية للتعليم العام

Science development office



Physics

Second Secondary Grade

Home Work

Week

I

20
26

Name:

Class:

School:

إعداد

محمد عنتر

مراجعة

مجدي فتحي - عمرو مالي

مكتب مستشار العلوم

عبدالله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د. هالة عبدالسلام

رئيس الإدارة المركزية للتعليم العام



Measurement - types of physical quantities - the International System of Units, and standard units:

First: Choose the correct answer:

1. Which of the following is a fundamental physical quantity?

- A) The speed of the Moon revolving around the Earth
- B) The radius of a hydrogen atom
- C) The air pressure inside a balloon
- D) The density of water

2. Which of the following is a derived physical quantity?

- A) The mass of a container filled with oil
- B) The time of the Earth's rotation around itself
- C) The distance between Cairo and Minya
- D) The weight of a small elephant

3. The unit of length in the Gaussian system is:

- A) Foot
- B) Kilometer
- C) Meter
- D) Centimeter



4. A Vernier caliper is used to measure:

- A) Length
- B) Mass
- C) Speed
- D) Time

5. If speed (v) = distance (d) / time (t), what is the unit of speed in the British system?

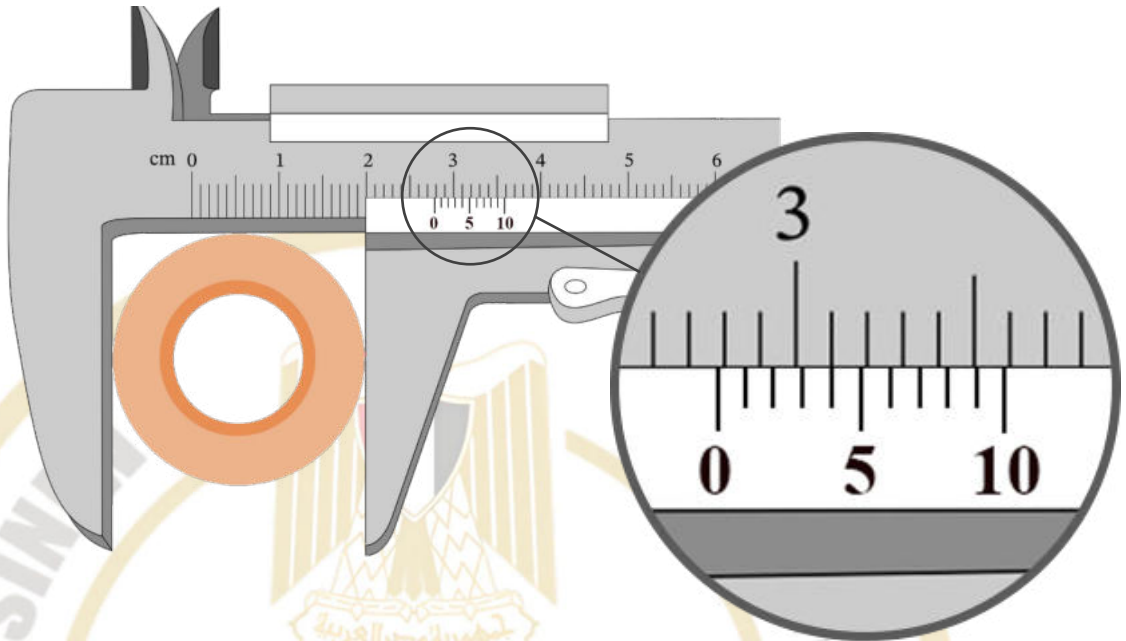
- A) Meter/second
- B) Centimeter/second
- C) Meter/hour
- D) Foot/second

6. The solid angle in the International System is measured in:

- A) Radian
- B) Steradian
- C) Kelvin
- D) Ampere

7. In the following figure, a student used a vernier caliper to measure the diameter of a small metal disc. According to the caliper reading, the diameter of the disc is:

- A) 27.4 cm
- B) 24.7 mm
- C) 27.4 mm
- D) 24.7 cm



8. When measuring the mass of a gold ring, it is preferable to use:

- A) Roman balance
- B) Digital scale
- C) Hourglass
- D) Measuring tape

9. The appropriate tool to measure swimming race times is:

- A) Measuring tape
- B) Stopwatch
- C) Hourglass
- D) Digital scale



10. The gram is the unit of mass in the _____ system.

- A) French
- B) International
- C) British
- D) Metric

11. The second is the unit of time in the _____ system.

- A) French
- B) Metric
- C) British
- D) All of the above

12. The pound is the unit of mass in the _____ system.

- A) French
- B) International
- C) British
- D) Metric

13. The most accurate clock used for measuring time is the:

- A) Hourglass
- B) Atomic clock
- C) Pendulum clock
- D) Stopwatch

Second: Essay Questions:

14. Complete the following table with suitable physical quantities or units of measurement:

Physical quantity	Gaussian system	Metric system	British system
-----	second		-----
.....	-----	-----	Pound
-----		meter	-----

15- Compare between standard meter, standard kilogram and second

Point of comparison	Definition	Physical quantity
Standard meter	----- -----	
Standard kilogram	----- -----	
Second	----- -----	



The measurement - Types of physical quantities - The International System of Units - Standard units

1- What are the main elements of measurement?

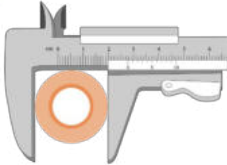
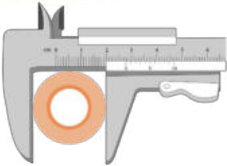
2- Compare between fundamental (basic) and derived physical quantities.

Point of comparison	Basic physical quantities	Derived physical quantities
Definition		
Examples		

3- The speed of the Earth's rotation around itself is not considered one of the basic physical quantities. Explain why.

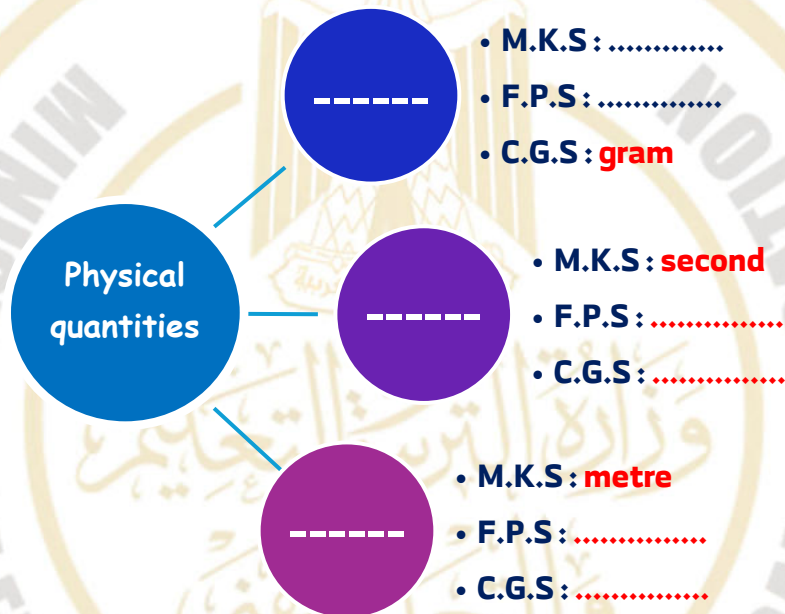
4- Mention some of the measuring tools used to measure length, mass, and time.

5- Choose the appropriate tool from the following tools to measure physical quantities in the following table:

N o	Physical quantity	Suitable measuring tool			
1	Width of homework Notebook				
		A	B	C	D
2	Length of the classroom door in your school				
		A	B	C	D
3	The mass of a large stone				
		A	B	C	D
4	Diameter of a ping-pong ball				
		A	B	C	D

5	Diameter of a thin wire				
		A	B	C	D

6- Complete the following table with the appropriate information:



7- What is the unit of measurement for electric current intensity and luminous intensity in the International System of Units?



8- If the physical quantity (X) = $\frac{\text{mass (m)}}{\text{time (t)}}$, Deduce the unit of measurement for the quantity (X) in the French system.

.....

.....

9- If the speed (v) = $\frac{\text{distance (d)}}{\text{time (t)}}$, and the kinetic energy: $(KE) = \frac{1}{2} \text{ mass (m)} \times \text{squared speed (v}^2\text{)}$, Deduce the unit of measurement for kinetic energy in the British system.

.....

.....

.....

.....

10- Complete the following table with the appropriate word:

Physical quantity	It's unit of measurement in the International System	The appropriate measuring tool
Mass of a golden ring		
The time taken by the runner to cover the distance in the race		
The length of a room in the house		



11 - Complete the following physical quantities chart with the appropriate units of measurement according to the International System of Units (SI):



12 - Why was glass not used instead of the platinum-iridium alloy as a standard unit for measuring length.

13 - Give reasons why the atomic clock is preferred for measuring time.



14- Complete:

If the average solar day = 24 hours, then the minute is equal to
of the average solar day.

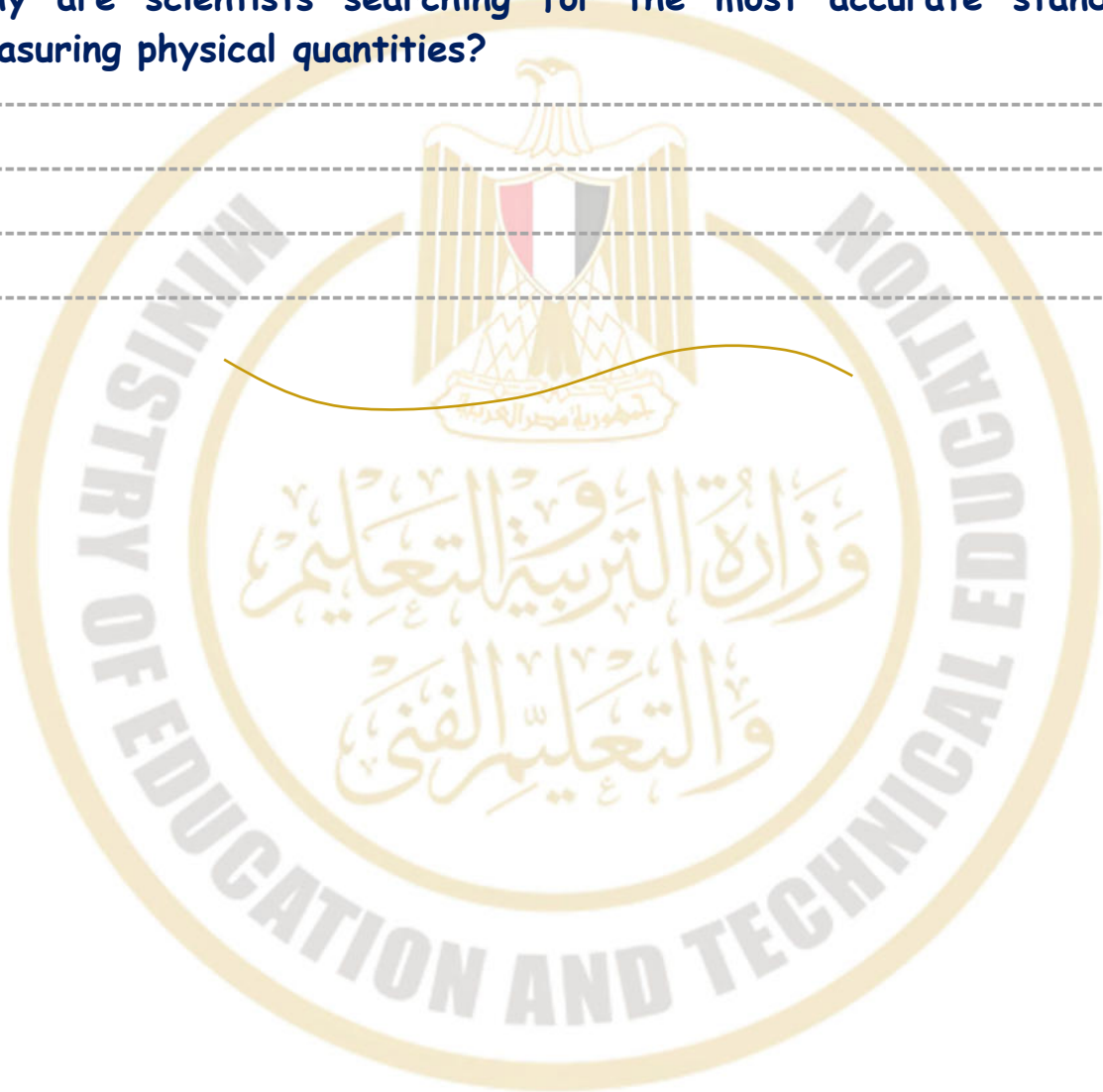
15- Why are scientists searching for the most accurate standard for measuring physical quantities?

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الإدارة المركزية للتعليم العام

Science development office



Physics

Second Secondary Grade

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عبدالله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام



Dimensional formula - Multiples and fractions of units - Measurement error

First: Choose the correct answer:

1-Which of the following correctly expresses the concept of dimensional formula?

- a) The relationship between numerical values of physical quantities.
- b) Expressing the physical quantity in terms of the fundamental quantities.
- c) Expressing the physical quantity using SI units only.
- d) The mathematical relationship between derived quantities.

2-What is the correct statement that describes the importance of the dimensional formula?

- a) If the dimensional formulas of both sides of the equation are identical, the equation must be correct.
- b) If the dimensional formulas of both sides of the equation are identical, the equation may be correct.
- c) If the dimensional formulas of both sides of the equation are identical, the equation must be incorrect.
- d) If the dimensional formulas of both sides of the equation are different, the equation may be correct.

3-If two physical quantities are of the same type, but the first follows the Gaussian system and the second the British system; which of the operations (addition, subtraction) can be performed?

- a) Both can be performed, since the condition is only that both quantities have the same dimensional formula.
- b) Cannot be performed, since they must have the same units.
- c) Only addition can be performed, since subtraction depends on proportionality.
- d) Only subtraction can be performed, since addition depends on proportionality.



- 4- Having the same dimensional formula on both sides of the equation
- a) Confirms its validity
 - b) Does not guarantee its validity
 - c) Confirms its error
 - d) Guarantees its validity
- 5- The unit of measurement of a physical quantity with dimensions $M^0 L T^{-2}$ is:
- a) m/s
 - b) $\text{kg} \cdot \text{m/s}^{-2}$
 - c) m/s^2
 - d) $\text{m} \cdot \text{s}^2$
- 6- If the dimensional formula of quantity **A** is $L T^{-1}$, and of **B** is T^{-1} , then the dimensional formula of $(A \times B)$ is:
- a) $L \cdot T^{-1}$
 - b) T^{-2}
 - c) $L T^{-2}$
 - d) $L T^0$
- 7- If the dimensional formula of **A** is $L \cdot T^{-1}$, and of **B** is T^{-1} , then the dimensional formula of $(A \times B)$ is:
- a) $L \cdot T^{-1}$
 - b) T^{-2}
 - c) $L \cdot T^{-2}$
 - d) $L \cdot T^0$
- 8- Three physical quantities **X**, **Y**, **Z** have the following dimensional formulas respectively:
Which of the following relations could be correct?
- a) $Z = XY$
 - b) $Z = \frac{X}{Y}$
 - c) $Z = \frac{Y}{X}$
 - d) $Z = Y^2/X$
- 9- If the wavelength of red light is $0.7 \mu\text{m}$, then its wavelength in millimeters equals:
- a) 7×10^{-3}
 - b) 7×10^{-4}
 - c) 7×10^{-6}
 - d) 7×10^{-7}
- 10- An electric current has a magnitude of 7 mA. Its value in μA is:
- a) 7×10^3
 - b) 7×10^6
 - c) 7×10^9
 - d) 7×10^{12}
- 11- Which of the following is an example of indirect measurement?
- a) Measuring the mass of a liquid with a hydrometer
 - b) Measuring the mass of an object with a balance
 - c) Measuring a person's height with a measuring tape
 - d) Measuring the volume of a cube by measuring its length
- 12- To measure the density of a liquid directly, is used
- a) Ruler
 - b) Micrometer
 - c) Hydrometer
 - d) Graduated cylinder



- 13-To measure a physical quantity accurately, the line of sight must be the instrument scale.
a) Parallel to b) Perpendicular to c) Above d) Below
- 14-A group of students estimated the mass of a gold ring, but the measurement was inaccurate. The source of error is most likely:
a) Using an ordinary balance instead of a sensitive one
b) Gold's density is high
c) The copper content in the alloy is low
d) The gold content in the alloy is low.
- 15-The ratio between the dimension of volume sphere to dimension of circle circumference equals the dimensions of
a) time b) length c) mass d) area

Second: Essay Questions:

Express the following quantities in the required units using scientific formula:

(a) 88 kg , in milligrams

(b) 1.8 MW, in kilowatts

(c) 50 mg, in kilograms

(d) $0.4 \mu\text{g}$, in milligrams



Dimensional formula - Multiples and fractions of units - Measurement error

First: Choose the correct answer:

1-The dimension formula of pi (π) is

a) $M^0 . L . T^0$

b) $M^0 . L^0 . T^0$

c) $M^0 . L . T$

d) $M . L . T$

2-The physical quantity that has dimensional formula of LT^{-1} , so its unit in the Gaussian system is

a) $g.cm^{-1}$

b) $cm.s^{-1}$

c) $m.s^{-1}$

d) $m.s$

3-Density = $\frac{\text{mass}}{\text{volume}}$ so the dimensional formula and unit of measurement in the British system

a) ML^{-3} , pound/foot³

b) ML^{-3} , g/cm³

c) ML^3 , pound/foot³

d) ML^{-3} , kg/m³

4-If the quantity X is calculated from the relation $X = Y + Z$ and the equation for the dimensions of Z is MLT^{-2} , then the unit of measurement of quantity Y is

a) Newton

b) joule

c) watt

d) kg m/s

5-If you know that $\frac{K}{t} = F . d + \frac{R}{t^2}$

So the dimensional formula of the quantity ($\frac{R}{K}$) is

a) ML^0T^0

b) M^0L^0T

c) M^0LT^0

d) $M^0L^0T^{-1}$



6- If the dimensional formula of the physical quantity (X) is ML^2T^{-2} and the dimensional formula of the physical quantity (Y) is LT^{-2} so the measuring unit of the quantity $(\frac{X}{Y})$ in the British system is

a) pound.s b) pound.foot c) g.cm d) kg.m

7- If the distance between the atoms in a crystal is 9×10^{-4} mm, then this is equal to

a) 9×10^{-7} cm b) 9×10^{-5} cm
c) 9×10^{-9} cm d) 9×10^{-10} cm

8-If mass C = sum of two masses A = 3 tons, B = 6000 g ,then mass C is equal to kg

a) 3600 b) 6003
c) 63000 d) 3006

9-An example of direct measurement is a measurement of

a) Room area by metric tape b) Body mass by a sensitive scale
c) Density of a liquid measured by its mass and volume d) cuboid volume by measuring length, width and height

10-Which of the following measurements is considered an indirect measurement..

a) Measuring speed with a speedometer b) Volume measurement by a graduated cylinder
c) Density measurement by hydrometer d) Area measurement by metric tape



Seond: Essay Questions:

11-Write each of the following quantities in the required unit between brackets:

a) Train speed 180 km/h. (in unit of m/s).

b) Vehicle speed 50 m/s. (in unit of km/h).

c) Gold density 19300 kg/m³ (in unit of g/cm³)

d) Aluminum density 2.7 g/cm³ (in unit of kg /m³)

12-Explain:

The existence of an error in the Ammeter measurement after several years of operating it ?

13-Explain:

The sensitive scale is kept inside a glass box?



14-From the relation $\frac{X}{t^2} = F \cdot v + \frac{Y}{d^2}$

Deduce the dimensional formula of the physical quantity (X) and (Y)

If you know that (t) is the time, (F) is the force, (v) is the velocity and (d) is the displacement

15-Verify from the validity of the relation $T = 2 \pi \sqrt{\frac{\ell}{g}}$

If you know that (T) is the time of one complete oscillation of a vibrating simple pendulum, (ℓ) is the length of the pendulum's thread and (g) is the gravity acceleration

الإدارة المركزية للتعليم العام

Science development office



Physics

Second Secondary Grade

20
26

Homework

Week

3

Name:

Class:

School:

إعداد

مجدي فتحي - محمد عنتر

مراجعة

عمرو مالي - حسن أشرف

مكتب مستشار العلوم

عبدالله مصطفى - سعيد محمد

إشراف

د/عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام



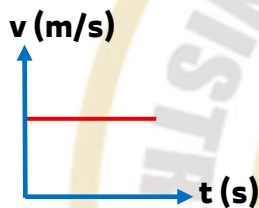
Chapter (2) Motion at a straight line

First: Choose the correct answer:

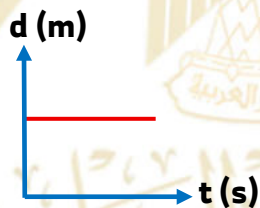
1- A body moves a displacement of 30 m east in 2 seconds, then a displacement of 40 m north in 3 seconds. The magnitude of the average velocity during the five seconds equals .

- A) 6 m/s B) 8 m/s C) 10 m/s D) 14 m/s

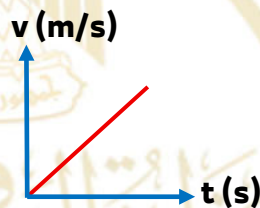
2) Which of the following graphs represents a body at rest?



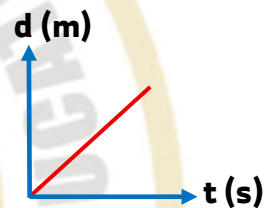
A)



B)

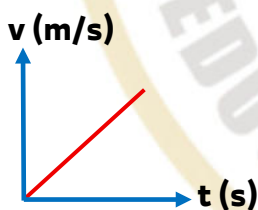


C)

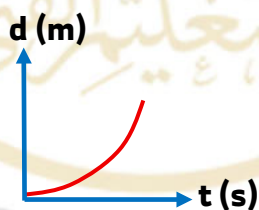


D)

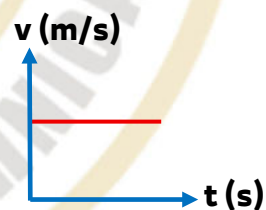
3- From the following graphs:



Graph (3)



Graph (2)



Graph (1)

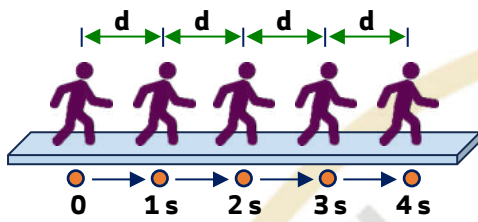
4) Which of the following graphs represent a body moving with non-uniform velocity?

- A) Graphs (1) and (2) B) Graphs (2) and (3)
C) Graphs (1) and (3) D) All graphs

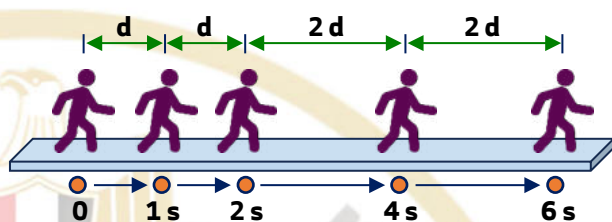
5) A body moves in a straight line for a distance (d) and then returns to the starting point along the same line. The total distance covered by the body is

- A) 0 B) $\frac{1}{2} d$ C) $2d$ D) $4d$

6) The following figures show the motion diagrams of two moving persons:



Person (1)

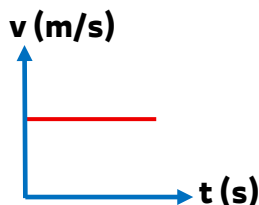
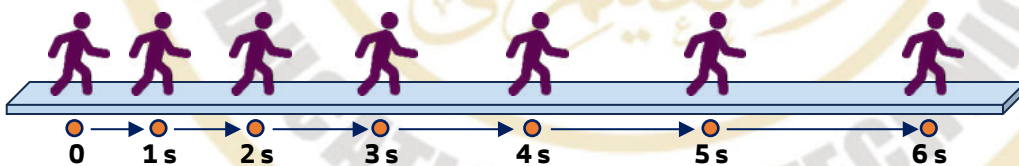


Person (2)

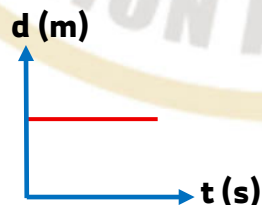
Which of the following choices describes the speed of motion of each person?

	Person (1)	Person (2)
(A)	Uniform velocity	Uniform velocity
(B)	Uniform velocity	Non-uniform velocity
(C)	Non-uniform velocity	Uniform velocity
(D)	Non-uniform velocity	Non-uniform velocity

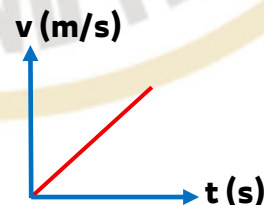
7) The figure shows the motion diagram of a moving person. Which of the following graphs represents the person's speed?



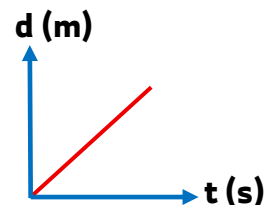
(A)



(B)

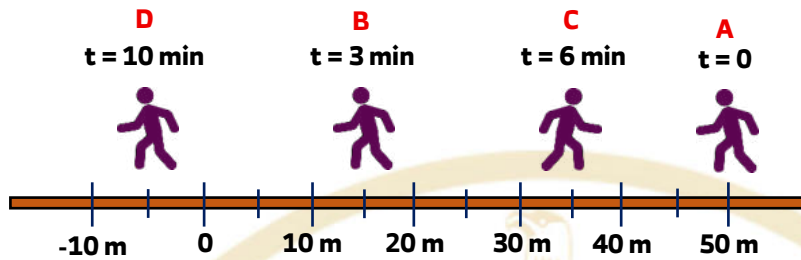


(C)



(D)

A person moves in a straight line along the path (A) → (B) → (C) → (D) in 10 minutes, as shown in the figure. Then:



	The average speed during the interval from 0 min to 3 min	The average speed of the body during the whole trip	The average velocity of the body during the whole trip
(A)	0.194 m/s	0.158 m/s	0.0917 m/s
(B)	11.67 m/s	9.5 m/s	11.67 m/s
(C)	0.194 m/min	0.158 m/min	0.194 m/min
(D)	11.67 cm/s	9.5 cm/s	11.67 cm/s

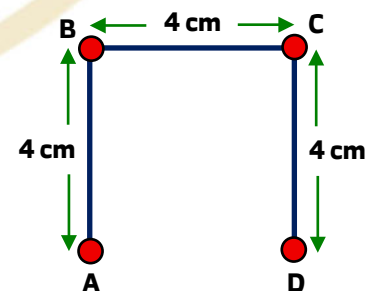
8- A body moves along the path ABCD, covering the distance AB in 0.5 s. Then:

First: The average speed of the body from A to B equals

- A) 2 cm/s B) 4 cm/s C) 6 cm/s D) 8 cm/s

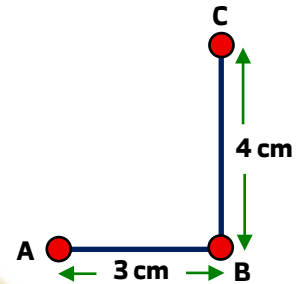
Second: If the average velocity of the body for the remaining path B → D is twice its average velocity from A → B, then the average velocity of the body for the whole trip equals

- A) 4 cm/s B) 4.69 cm/s C) 9.66 cm/s D) 12 cm/s

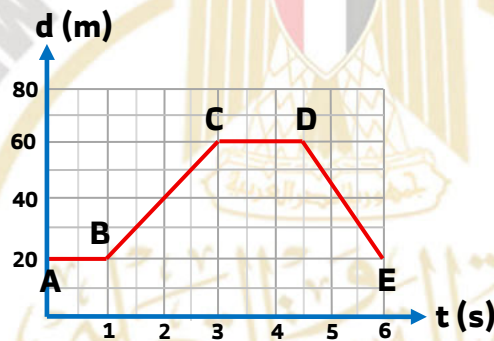


9- A body moves along the path ABC in 2 seconds. The average velocity of the body equals

- A) 1 m/s B) 2.5 m/s C) 3.5 m/s D) 6 m/s



10) The opposite graph shows the displacement (d) — time (t) curve for a body:



(1) First: During which time intervals is the body at rest?

- a) AB, BC b) BC, CD c) DE, BC d) AB, CD

(2) Second: During which time interval is the body's velocity positive?

- a) AB b) BC c) CD d) DE

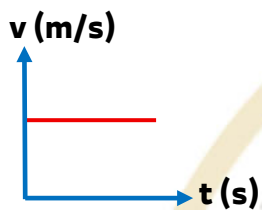
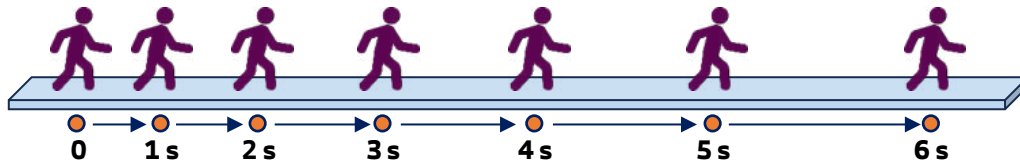
(3) Third: During which time interval is the body's velocity negative?

- a) AB b) BC c) CD d) DE

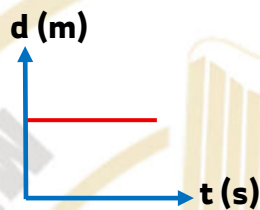
(4) Fourth: The average velocity of the body after 6 s equals

- a) 0 b) 3.3 m/s c) 10 m/s d) 13.3 m/s

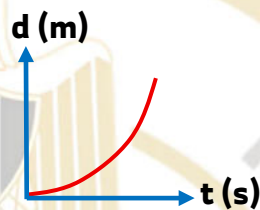
11- The figure shows the diagram of a moving person. Which of the following choices represents the speed of the body?



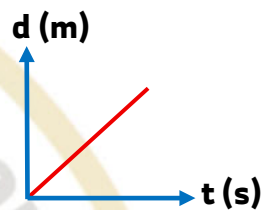
(A)



(B)



(C)



(D)



Second: Essay Questions:

12- Compare between

Comparison	Speed	Velocity
Definition		
Types		
Mathematical relation		
Measuring unit		

13- Compare between

Comparison	Average velocity	Instantaneous velocity
Definition		
The velocity mathematically using the displacement–time graph		

14- What is meant by?

a) The speed of a car = 10 m/s.

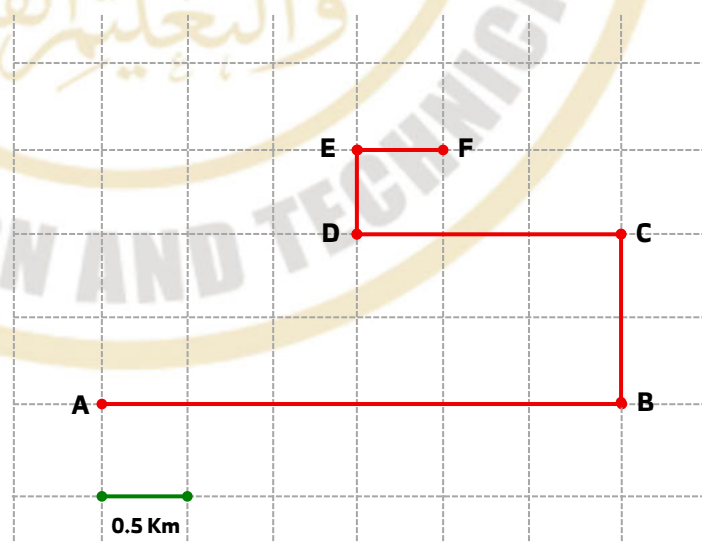
b) The velocity of a body = 6 m/s.



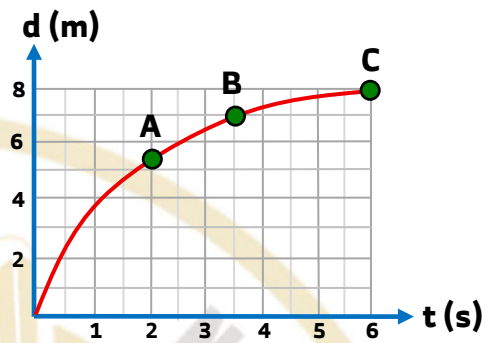
15- When does the average velocity of a moving body become numerically equal to zero?

16- A train moves in a straight path in one direction, covering half of the total distance at a speed of 60 km/h and the remaining half at a speed of 120 km/h. Calculate the train's average velocity throughout the whole motion.

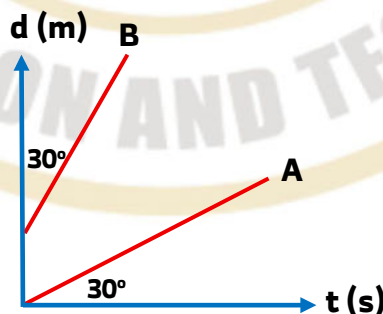
17) A body moves along the grid through the points (A), (B), (C), (D), and (F) as shown in the figure. Determine the average speed in m/s if the total time of the trip is 4 minutes.



18) The opposite figure shows the displacement–time (d – t) graph of a moving body. Arrange the velocities at points (A), (B), and (C) in ascending order, and then explain your answer.



19) The opposite figure shows the displacement–time (d – t) graph for two moving bodies (A) and (B) with respect to a fixed point. Calculate the ratio of the velocity of body (A) to the velocity of body (B).



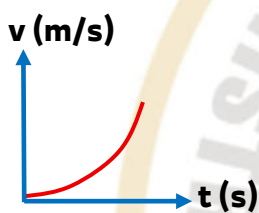
Chapter (2) Motion at a straight line

First: Choose the correct answer:

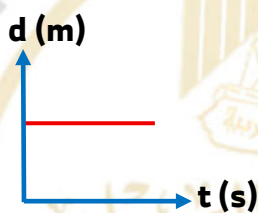
1- An object moves a displacement of 60 m east in 4 s, then a displacement of 80 m west in 6 s. The average velocity during the 10 seconds equals

- A) 2 m/s east B) 2 m/s west C) 14 m/s east D) 14 m/s west

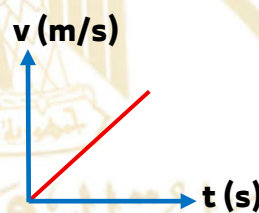
2- Which of the following graphs represents a body moving with uniform (constant) velocity?



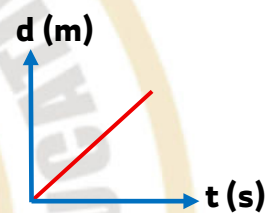
A)



B)



C)



D)

3- From the opposite graphs:

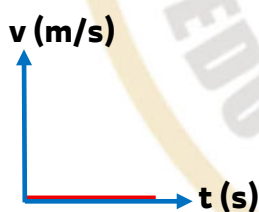


Figure 3

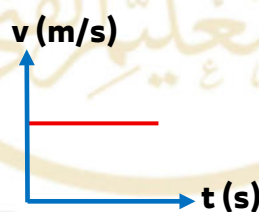


Figure 2

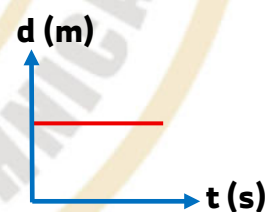


Figure 1

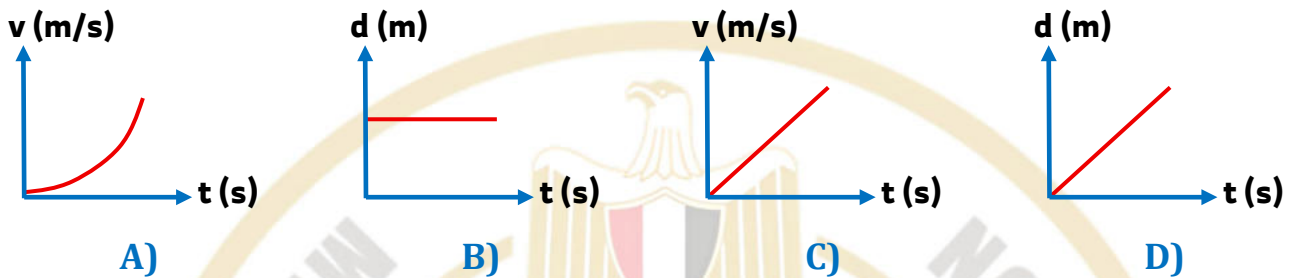
Which of the following graphs represent a stationary body ?

- ☐ Graphs (1) and (2) ☐ Graphs (2) and (3) ☐ Graphs (1) and (3) ☐ All graphs

4- A body moves in a straight line a distance (d) and then returns to the starting point along the same line. The total displacement of the body is

- A) Zero B) $d/2$ C) $2d$ D) $4d$

5- The opposite figure shows the motion diagram of a moving person. Which of the following graphs correctly represents the person's speed?



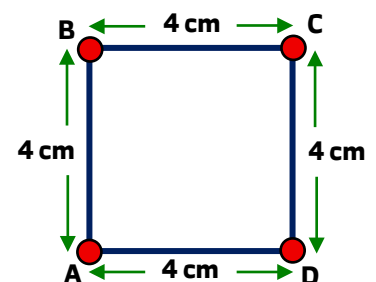
6- A body moves in a straight line along the path from (A) to (C) and then to (B) during two hours, as shown in the following figure. Then:



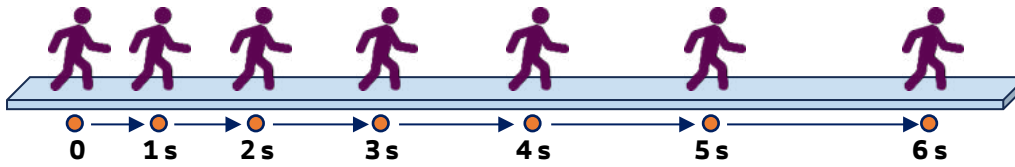
	The distance covered by the moving body	The magnitude of displacement	The average speed	the average velocity
(A)	9 km	9 km	4.5 km	4.5 km
(B)	11 km	11 km	5.5 km	5.5 km
(C)	14 km	9 km	7 km	4.5 km
(D)	14 km	4 km	7 km	2 km

7- A body moves along the path ABCDA in 2 seconds. The average velocity of the body equals

- A) 0 B) 2 cm/s c) 4 cm/s D) 6 cm/s

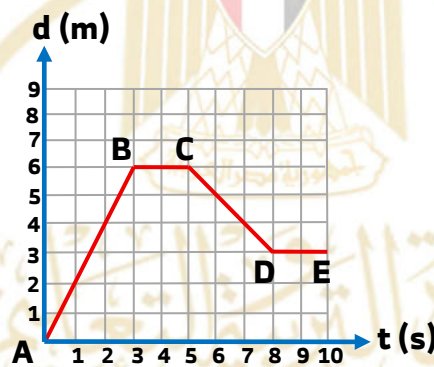


8- The figure shows the motion diagram of a moving person. Which of the following choices represents the speed of the body?



- A) Uniform throughout the whole trip B) Non-uniform throughout the whole trip
C) Uniform then non-uniform D) Non-uniform then uniform

9- The opposite figure shows the displacement (d) — time (t) graph for a body:



- (1) First: During which time intervals is the body at rest?
A) AB, BC B) BC, CD C) DE, BC D) AB, CD
- (2) Second: During which time interval is the body's velocity positive?
A) AB B) BC C) CD D) DE
- (3) Third: During which time interval is the body's velocity negative?
A) AB B) BC C) CD D) DE
- (4) Fourth: The average velocity of the body over the full 10 s equals
A) 0.3 m/s B) 0.6 m/s C) 0.9 m/s D) 1.2 m/s



Second: Essay Questions:

10- Compare between:

Comparison	Uniform velocity	Variable velocity (non-uniform)
Definition		
Displacement–Time Graph		

11- Compare between:

Comparison	Transitional motion	Periodic motion
Definition		
Examples		

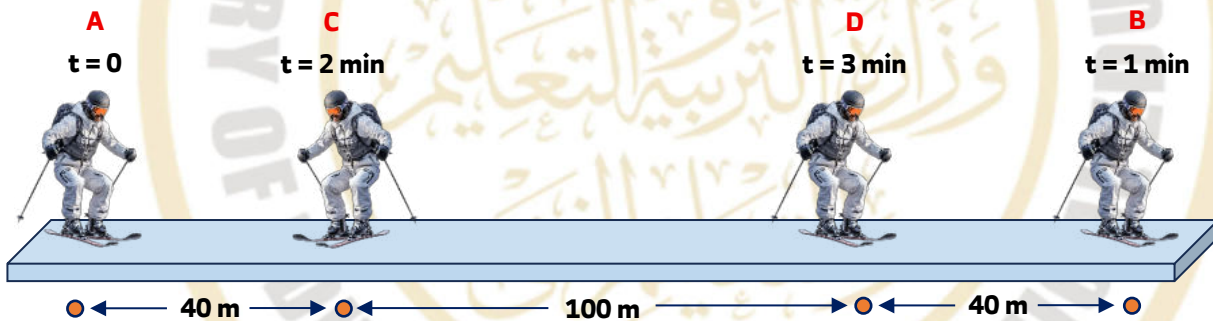
12- What is meant by?

a) The **speed** of a car = **10 m/s**.

b) The **velocity** of a body = **6 m/s**.

13) When does the instantaneous speed of a moving body become equal in magnitude to its average speed?

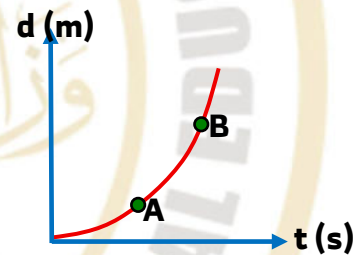
14) The figure shows the motion (along a straight line) of an ice skater starting at point A at time $t = 0$ min and arriving at point D at time $t = 3$ min, covering the distances indicated in the figure along the path $A \rightarrow B \rightarrow C \rightarrow D$. Calculate the skater's average velocity for the whole trip.



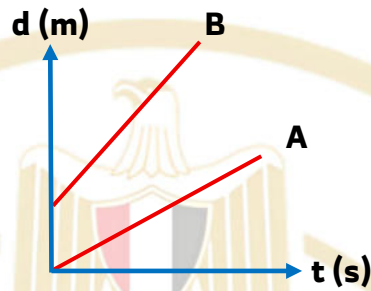


15) A train moves in a straight path for a time period (t) with an average speed (v), then continues moving for a time period ($3t$) with an average speed ($3v$). Calculate the average speed of the train during the whole motion.

16) The opposite figure shows the displacement–time graph of a moving body. At which of the two points (A) or (B) is the velocity greater, and why?



17) The adjacent figure shows the displacement–time graph for two moving bodies (A) and (B) with respect to a fixed point.
Which of the two bodies has the greater speed, and why?





Physics

Second Secondary Grade

20
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Homework

Week

4

Name:

Class:

School:

إعداد

مجدي فتحي - محمد عنتر

مراجعة

عمرو مالي - حسن أشرف

مكتب مستشار العلوم

عبدالله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/ هالة عبدالسلام خفاجي

رئيس الإدارة المركزية للتعليم العام



Chapter (2) / (Acceleration)

First Choose the correct answer:-

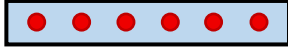
- 1) Which of the following statements does not correctly describe the acceleration?**
 - a) An object increases its velocity during motion**
 - b) An object that changes the direction of its velocity during motion**
 - c) An object that decreases its velocity during motion**
 - d) An object that changes its displacement regularly over time**

- 2) When the driver presses the brake, the car moves at an acceleration of**
 - a) in the same direction as its motion, slowing down**
 - b) in the opposite direction to its motion, slowing down**
 - c) in the same direction as its motion, speeding up**
 - d) in the opposite direction to its motion, speeding up**

- 3- When a ball rolls down an inclined plane,**
 - a) its velocity increases, so the acceleration is positive**
 - b) its velocity increases, so the acceleration is negative**
 - c) its velocity decreases, so the acceleration is positive**
 - d) its velocity decreases, so the acceleration is negative**

- 4- If a body starts moving from rest, the ratio of its velocity after a certain time to its acceleration is equal to**
 - a. Initial velocity of the body**
 - b. Final velocity of the body**
 - b) Acceleration of the body**
 - c) Time of movement of the body**

5- When you observe the motion of four different objects at equal time intervals as shown in the figures below, which figure represents a case where the acceleration is in the same direction as the motion?



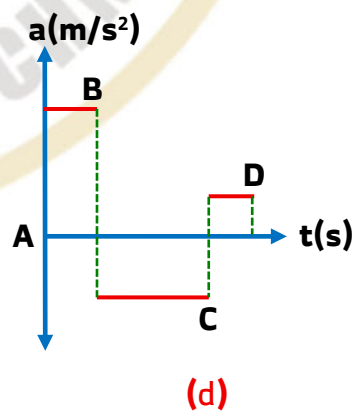
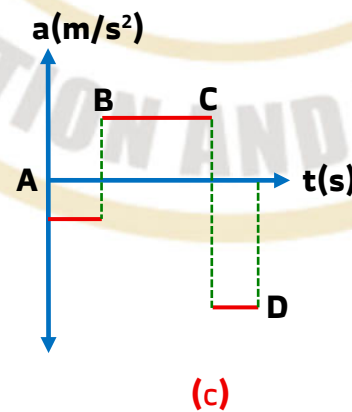
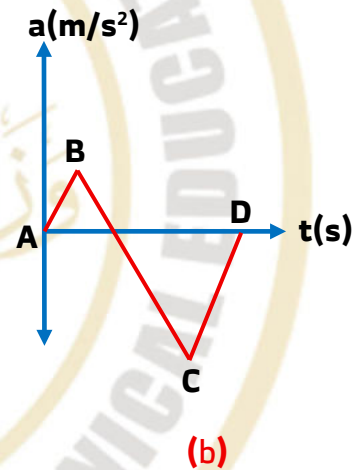
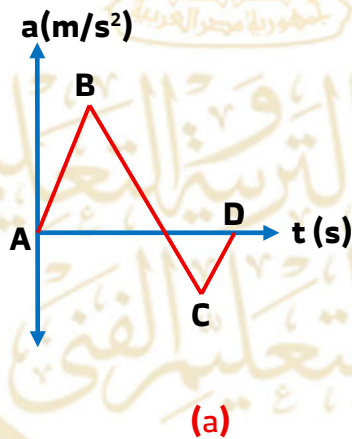
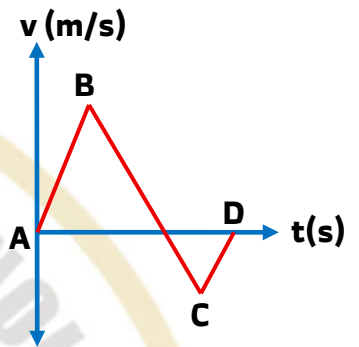
Object(A)

Object(B)

Object(C)

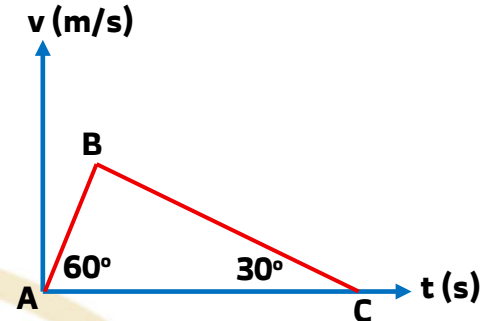
Object(D)

6- If the graph shows the change in the velocity of a moving object over time, Then, which of the following graphs shows the change in the acceleration of the same object over the same periods of time?

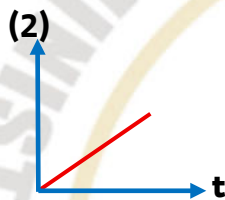


7- The graph shows the relationship between the velocity of an object (v) and time (t). The ratio between its acceleration in the period (AB) and its acceleration in the period (BC) is equal to

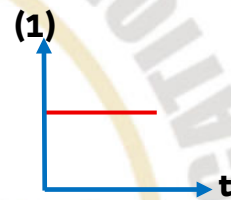
- (a) $\frac{1}{2}$ (b) $\frac{1}{3}$
(c) $\frac{2}{1}$ (d) $\frac{3}{1}$



8- If the following two graphs represent the motion of two bodies, A and B, at constant acceleration, then the dimension formula of the physical quantity resulting from the ratio between quantities (1) and (2) are, respectively,



(A)



(B)

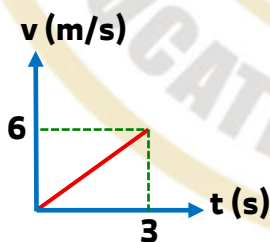
(a) $M^0.L^0.T$

(b) $M^0.L^0.T^{-1}$

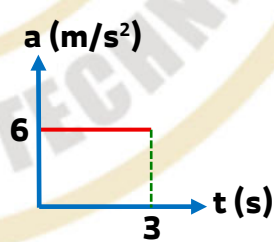
(c) $M^0.L.T^{-2}$

(d) $M^0.L^0.T^{-2}$

9- If the following two graphs represent the motion of two bodies, A and B. Then, the ratio between the acceleration of object (A) and that of object (B) is equal to



(A)



(B)

(a) $\frac{2}{1}$

(b) $\frac{3}{1}$

(c) $\frac{1}{2}$

(d) $\frac{1}{3}$



Second: Essay

1. Object (A) began moving from rest at an acceleration of 2 m/s^2 , while object (B) began moving at a velocity of 20 m/s at an acceleration of -2 m/s^2 . Calculate the velocity of each object 5 seconds from the start of motion.



Chapter (2) / (Acceleration)

First Choose the correct answer:-

1) The dimensional formula of acceleration is.....

(a) $M^0 L / T^2$

(b) $M^0 L^{-2} T^0$

(c) $M^0 L^{-1} T^2$

(d) $M^{-2} L^0 T^0$

2- If the velocity of a car increases uniformly, its acceleration is

(a) always positive

(b) always negative

(c) always zero

(d) positive or negative depending on the direction of velocity

3- A car is moving north at a velocity of 90 km/h. If its acceleration is 3 m/s^2 south, its velocity after 6 s will be

(a) 25.2 m/s north

(b) 7 m/s south

(c) 25.2 km/h north

(d) 7 km/h south

4- An object started moving from rest at a constant acceleration. Its average velocity during time (t) from the starting was 9 m/s. So, its average velocity during time (3t) from the starting is

(a) 9 m/s

(b) 18 m/s

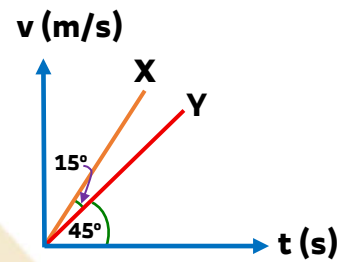
(c) 27 m/s

(d) 3 m/s

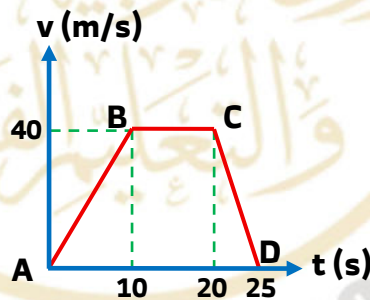
5- The corresponding graph shows the relationship between the velocity (v) of two objects (X) and (Y) and time (t). The ratio between the acceleration of objects (X) and (Y) respectively is

a, $\frac{\sqrt{3}}{1}$
c, $\frac{1}{\sqrt{3}}$

b, $\frac{\sqrt{2}}{1}$
d, $\frac{1}{\sqrt{2}}$



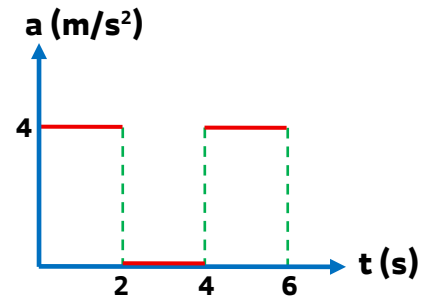
6- By studying the graph shown, the ratio between the magnitude of the acceleration in period (AB) and its magnitude in period (CD) is equal to



(a) $\frac{1}{2}$
(c) $\frac{2}{1}$

(b) $\frac{1}{1}$
(d) $\frac{5}{2}$

7- The corresponding graph shows the relationship between the acceleration of an object and the time it takes to move. According to the graph, the velocity of the object after 5 seconds from the starting of motion is equal to



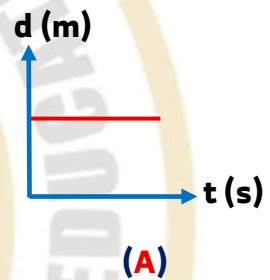
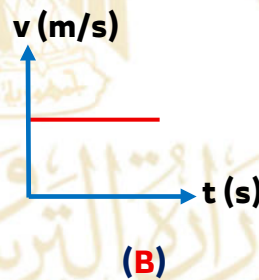
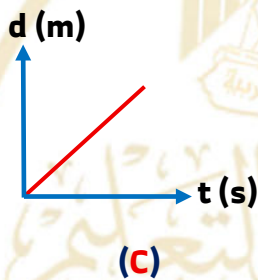
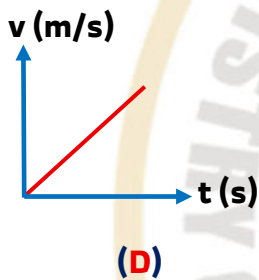
(a) 8 m/s

(b) 16 m/s

(c) 4 m/s

(d) 12 m/s

8- Based on your study of the following graphs, the relationship that expresses the motion of a body with acceleration = zero is



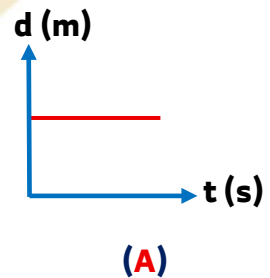
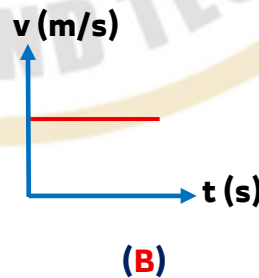
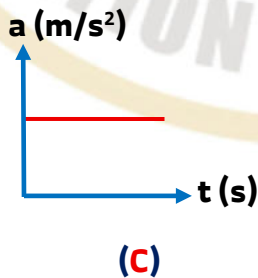
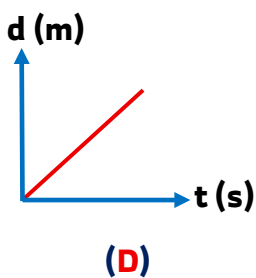
(a) Only graphs (C) and (B)

(b) Only graph (B)

(c) All the graphs

(d) Only graphs A, B and C

9- Based on your study of the following graphs, the relationship that expresses the motion of a body with a uniform acceleration is



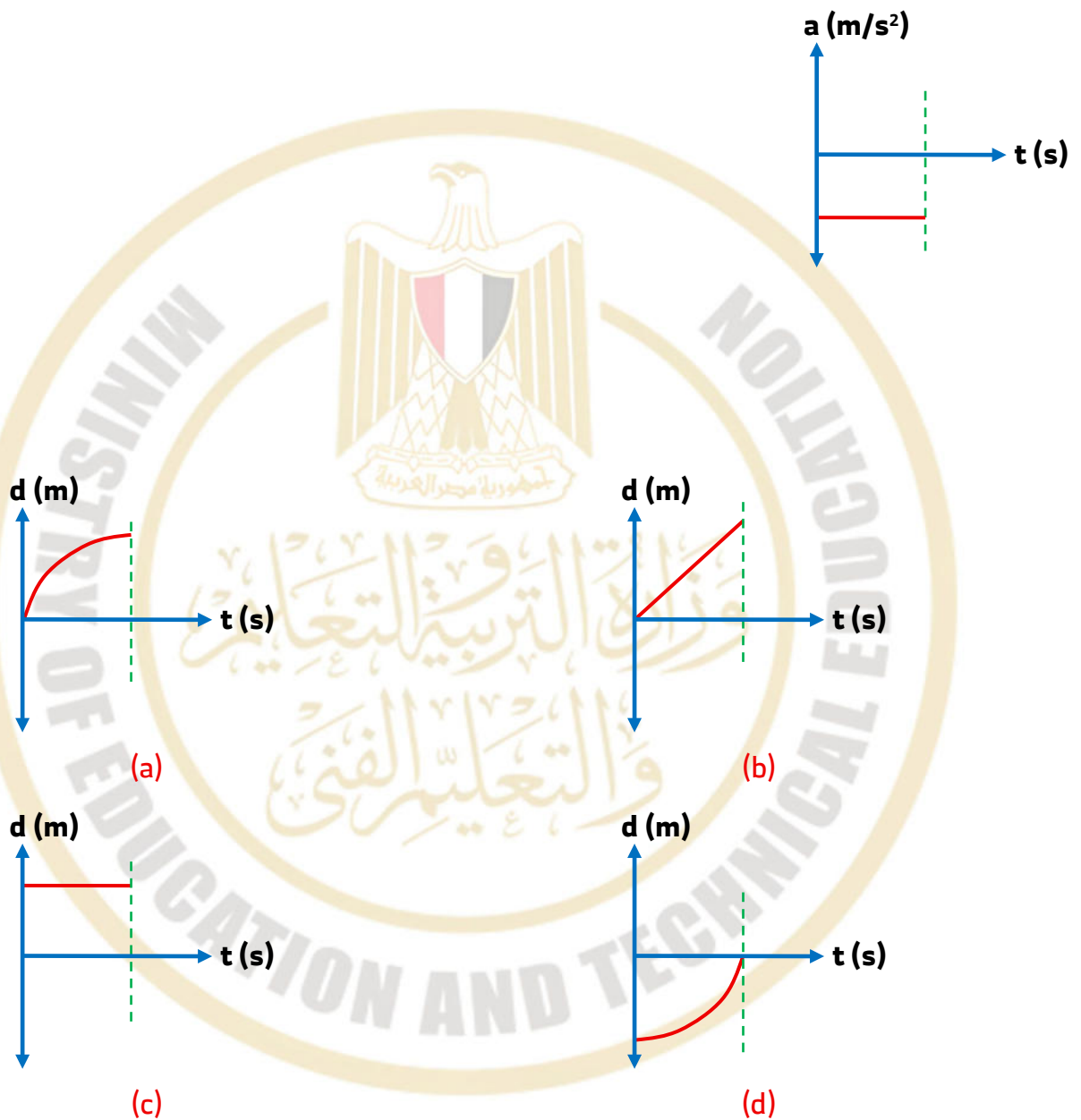
(a) Only graphs (B) and (C)

(b) Only graph (C)

(c) All the graphs

(d) Only graphs C and D

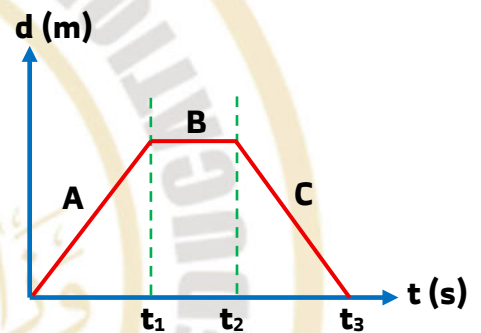
10- If the graph shows the acceleration of an object over time, then the graph showing the change in displacement of the same object over the same period of time is



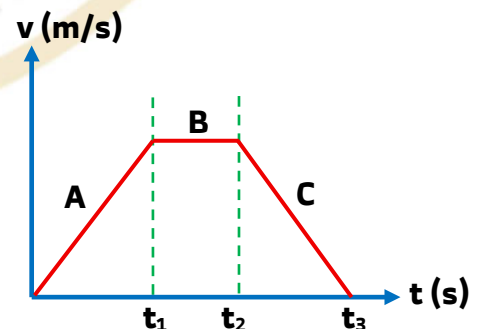
Second: Essay questions

11. An object moves from rest at a constant acceleration, and its average velocity is 12 m/s when its displacement is 24 m. Calculate its average velocity during the first 10 s of the motion.

12. The corresponding graph: Illustrates the relationship between displacement (d) and time (t) of an object. Draw a graph to illustrate the relationship expressing the acceleration (a) of the object in each time interval.



13. The corresponding graph: Illustrates the relationship between velocity (v) and time (t) of an object. Draw a graph to illustrate the relationship expressing the acceleration (a) of the object in each time interval.



14. A car is moving at a constant velocity of 90 km/h in a straight line. When the driver presses the brakes, the car starts to decelerates uniformly until stops after 12.5 s. Calculate the acceleration of the car before and after pressing the brakes and determine the type of each.

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15. An object moves with a constant acceleration of 3 m/s^2 . Calculate its velocity after 15 s if it started moving at a velocity of 30 m/s.

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الإدارة المركزية للتعليم العام

Science development office



Physics

Second Secondary Grade

20
26

Home Work

Week

5

Name:

Class:

School:

إعداد

محمد عنتر

مراجعة

مجدي فتحي - حسن أشرف

مكتب مستشار العلوم

عبدالله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام



Homework

Chapter (3) Newton's first law & Newton's second law

First: Choose the correct answer:

- 1) A body of mass **2 kg** moves with a velocity of **4 m/s**, then accelerates at **3 m/s²** for **5 seconds**.

The change in its momentum during this period is

- a) 15 N·s b) 19 N·s c) 30 N·s d) 38 N·s

- 2) You have four bodies **A, B, C**, and **D**. The following table shows the mass and velocity of each:

	A	B	C	D
m	2 Kg	3 Kg	4 Kg	4 Kg
v	6 m/s	4 m/s	4 m/s	2 m/s

Which two bodies have the same momentum?

- a) A, B b) B, C c) C, D d) D, A

- 3) A momentum of **60 kg·m/s** means that a body

- a) has a mass of 60 kg and an acceleration of **1 m/s²**
b) has a mass of 60 kg and a velocity of **10 m/s**
c) has a mass of 60 kg and a speed of **10 m/s**
d) has a mass of 6 kg and an acceleration of **10 m/s²**



4) A father (**90 kg**) runs at a speed of **1 m/s** in a race with his son (**40 kg**) who runs at **2.25 m/s**. The father's momentum is the son's momentum.

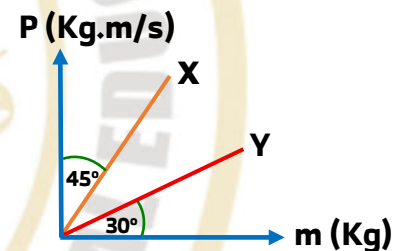
- a) double b) half c) equal to d) a quarter of

5) If the mass of a body is reduced to **half** and its momentum is **doubled**, then its velocity

- a) does not change b) decreases to half c) doubles d) becomes four times

6) From the adjacent graph, the ratio between the velocities of the two bodies v_x/v_y equals ..

- a) $1/\sqrt{2}$ b) $\sqrt{2}/1$
c) $1/\sqrt{3}$ d) $\sqrt{3}/1$



7) If an average force acts on a body for a certain period of time, then the product of this force and the time interval equals

- a) velocity b) acceleration c) momentum d) change in momentum



12) If the force acting on a moving body is doubled, its mass

- a) decreases to half b) doubles c) remains constant d) becomes four times

13) Two equal forces act on two bodies of masses **1 kg** and **5 kg**.

If the smaller body acquires an acceleration of **20 m/s²**, then the acceleration of the second body equals

- a) 0.05 m/s² b) 0.25 m/s² c) 4 m/s² d) 20 m/s²

14) A cart of **500 kg** and another of **1500 kg** move with the same acceleration.

The force acting on the larger cart the force acting on the smaller one.

- a) decreases one-third b) equals to c) doubles d) increases three times

15) A body of mass (**m**) is acted upon by a force of (**2F**).

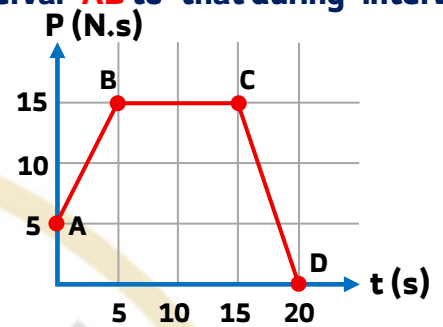
When a force of (**5F/2**) acts on another body of mass (**3m**), the ratio between the accelerations of the first and second bodies respectively equals

- a) 6/5 b) 5/3 c) 15/4 d) 12/5

- 16) The opposite graph shows the relationship between the change in a body's momentum and time.

The ratio between the magnitude of the force during interval **AB** to that during interval **CD** equals

- a) $1/1$ b) $2/3$
c) $3/2$ d) $3/4$



Second: Essay Questions

Two trucks designed for transporting goods – the first is empty (1) and the other fully loaded (IV (2) are moving at the same speed. Compare the inertia of each and explain your answer.



(2) Car

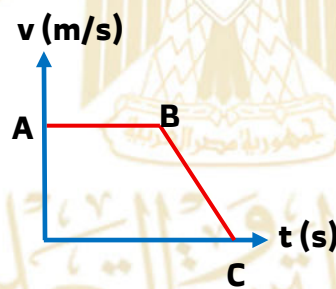


(1) Car

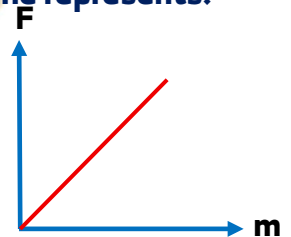


- 18) A force of **10N** acts on a wooden cube, giving it an acceleration (**a**). When the same force acts on another cube, it produces an acceleration equal to (**3a**). Calculate the ratio between the mass of the first cube and that of the second cube.

- 19) The opposite graph represents the motion of a car during two successive stages, **AB** and **BC**. In which of the two stages is the net force on the car **not** equal to zero, and why?



- 20) The opposite graph shows the relationship between the applied force and the masses of different bodies. From the graph, determine what the slope of the straight line represents.



- The end -



Weekly Assement

Chapter (3) Newton's frist law & Newton's second law

First: Multiple Choice Questions

1) Newton's First Law is called the Law of

- a) conservation of Energy b) inertia c) action and Reaction d) Conservation of Mass

2) The mathematical expression of Newton's First Law can be written as

- a) $F_1 = -F_2$ b) $F = m \cdot a$ c) $\Sigma F = 0$ d) $\Sigma F \neq 0$

3) According to Newton's First Law, if the net force acting on a body is zero, it moves with acceleration that is

- a) uniform b) negative c) zero d) positive

4) The forward motion of passengers when a car suddenly stops is due to

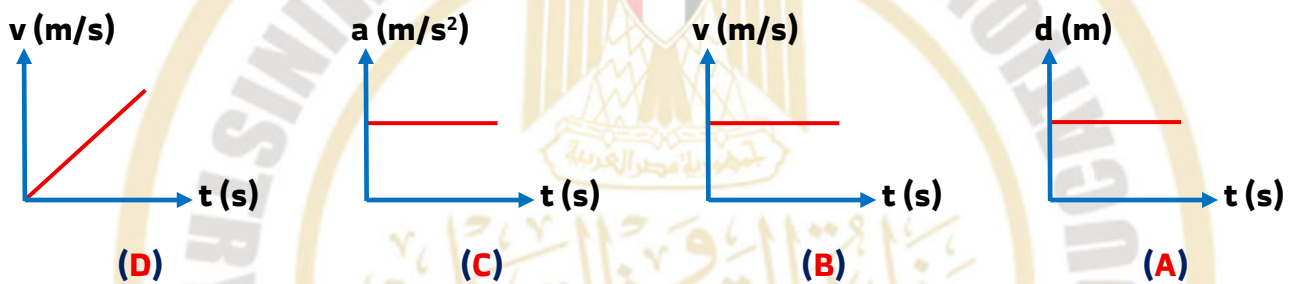
- a) gravitational force b) the state of rest the car was in c) inertia d) acceleration of motion

5) Two bodies are moving with the same speed.

If the mass of the first is three times that of the second, then the inertia of the second body is the inertia of the first.

- a) three times b) equal to c) nine times d) one-third

6) From the following graphs, the one that represents Newton's First Law is ..

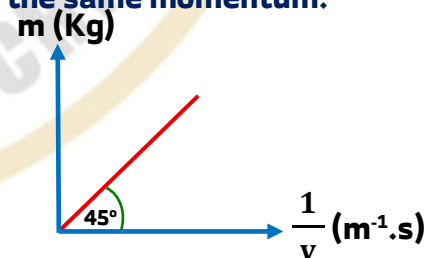


- a) Graph C Only b) Graphs A and B only c) Graphs A, B, and C Only d) All the graphs

7) The opposite graph shows the relationship between the mass (m) of several bodies and the reciprocal of their velocity ($1/v$) when all of them move with the same momentum.

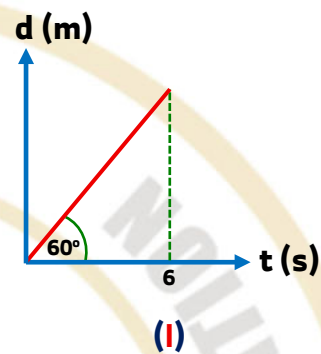
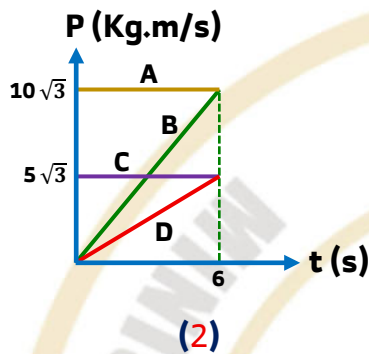
The momentum of any of them equals

- a) 0.1 kg·m/s b) 10⁻³ g·m/s
c) 1 kg·cm/s d) 10⁻³ g·m/s



8) Figure (1) represents the graphical relationship between displacement (d) and time (t) for a body of mass **5 kg** moving with a uniform velocity in a straight line.

The graph in Figure (2) that correctly represents the relationship between the momentum (P) of this body and time (t) during the same time interval is

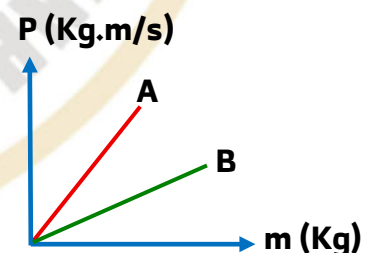


- a) A b) B c) C d) D

9) The opposite graph shows the relationship between the momentum (P) of two bodies (A) and (B) and their respective masses (m). which of the following statements is correct?

- a) The velocity of body (A) is greater than that of body (B)
 b) The velocity of body (B) is greater than that of body (A)
 c) The velocity of body (A) equals the velocity of body (B)

d) The momentum of body (B) is greater than that of body (A) if they have the same mass





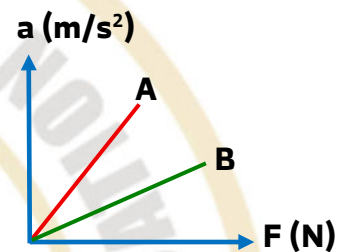
10) The mathematical expression of Newton's Second Law can be written as

- a) $F_1 = -F_2$ b) $F = m \cdot a$ c) $\Sigma F = 0$ d) $F = m \cdot v$

11) The opposite graph shows the relationship between the applied force and the motion of two bodies (A) and (B).

If both bodies are acted upon by the same force, then

- a) The acceleration of body (A) is greater than that of body (B)
b) The acceleration of body (A) is smaller than that of body (B)
c) The acceleration of body (A) equals that of body (B)
d) The mass of body (A) is greater than the mass of body (B)



Second: Essay Questions

12) Space rockets do not consume fuel after leaving the Earth's gravitational field. Explain why.

13) A resultant force of **10 N** acts on a body of mass **4 kg**.

Calculate the acceleration of the body.

- 14) A body is acted upon by a force of **100 N**, producing an acceleration of **4 m/s²**.

If the body is then acted upon by a force of **225 N**, calculate the acceleration in the second case.

- 15) A car of mass **1000 kg** is moving at a speed of **90 km/h** in a straight path.

When the driver applies the brakes, the car comes to a completely stop after **10 seconds**.

Calculate the magnitude of the frictional force acting on the car until it stops.



Physics

Second Secondary Grade

20
26

Home Work

Week

6

Name:

Class:

School:

إعداد

محمد عنتر

مراجعة

مجدي فتحي - حسن أشرف

مكتب مستشار العلوم

عبدالله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام



Chapter 3 | Newton's Second Law – Newton's Third Law

First: Multiple Choice Questions

1) A car is moving at a speed of **4 m/s**, which increased to **6 m/s** in **2** seconds.

If the mass of the car is **2000** kg, the force causing this change in speed equals:

- (A) 4000 N (B) 2000 N (C) 5000 N (D) 3000 N

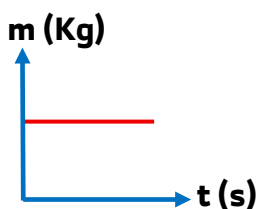
2) A car of mass **200** kg is moving at **4** m/s. The driver presses the brakes, and the car stops after **2** seconds. The momentum of the car before braking and the force acting on the car are respectively:

- (A) 800 kg·m/s, -200 N (B) 800 kg·m/s, 200 N
(C) 800 kg·m/s, -400 N (D) 800 kg·m/s, 400 N

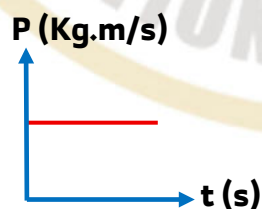
3) A force **F₁** acts on a body, causing it to move with uniform acceleration. During its motion, it experiences a frictional force **F₂**. The product of the body's mass × its acceleration equals:

- (A) $F_1 \div F_2$ (B) $F_1 - F_2$ (C) $F_1 + F_2$ (D) $F_2 - F_1$

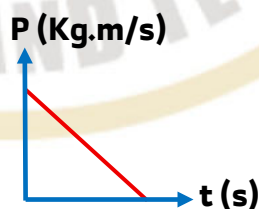
4) Which of the following graphs represents a body moving under the effect of frictional force?



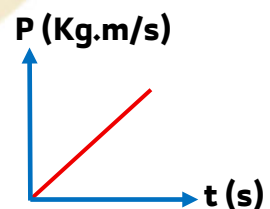
(A)



(B)



(C)

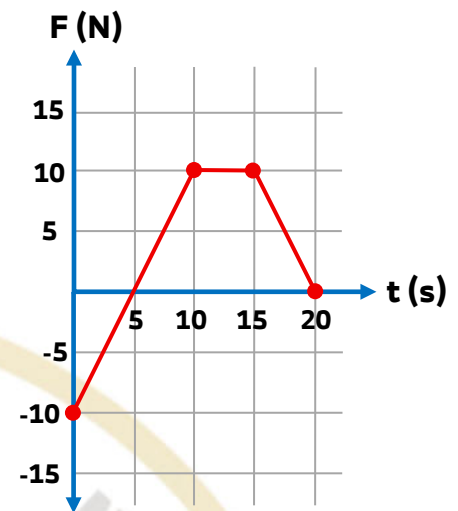


(D)

5) The opposite graph shows the change of the resultant

force acting on a car that started moving from rest, and the time of this change. According to the graph data, the change in momentum during 20 seconds is:

- (A) $-75 \text{ N}\cdot\text{s}$ (B) $75 \text{ N}\cdot\text{s}$
(C) $-125 \text{ N}\cdot\text{s}$ (D) $125 \text{ N}\cdot\text{s}$



6) According to Newton's Third Law, the action and reaction forces:

- (A) act on the same body
(B) are equal in magnitude and have the same direction
(C) act on two different bodies and are equal in magnitude but opposite in direction
(D) act on the same body and have the same magnitude and same direction

7) In the opposite figure, a hockey player hits the ball with his stick.

The action and reaction forces do not cancel each other because:

- (A) the force of the stick on the ball is greater than the force of the ball on the stick
(B) the two forces act on different bodies
(C) the force of the stick on the ball is less than the force of the ball on the stick
(D) the two forces act on the same body



8) In the opposite figure, four books are placed on a table.

Their weights are shown on the figure as 4 N, 5 N, 15 N, and 25 N.

The reaction force of the table on all the books together equals:

- (A) 25 N (B) 49 N (C) 5 N (D) 15 N



9) The acceleration of the body shown equals:

- (A) 0.2 m/s^2 (B) 5 m/s^2 (C) 10 m/s^2 (D) 0

150 N ← 50 Kg → 400 N

10) A force of 300 N acts on a body of mass 30 kg to move it. Neglecting friction, the acceleration gained by the body equals:

- (A) 0.1 N/kg (B) 10 N/kg (C) 100 N/kg (D) 9000 N/kg

11) If a force of 50 N acts on a body of mass 20 kg, the rate of change of velocity of this body equals:

- (A) 2.5 N/kg (B) 2.5 kg/N (C) 2.5 N/kg^{-1} (D) $2.5 \text{ N}^{-1} \cdot \text{kg}$

12) Two cars are moving, and the ratio between their masses is 2 : 1, while the ratio between their accelerations is 2 : 1. The ratio between the resultant forces acting on them is:

- (A) 1:1 (B) 1:2 (C) 4:1 (D) 1:4



Second : Essay Questions

- 13) A car of mass (m) and another car of mass ($2m$) start moving from rest with the same acceleration.

Calculate the ratio between the driving (**net**) forces acting on the two cars, respectively.

- 14) A force of **1** N acts on a wooden cube and gives it a certain acceleration.

When the same force acts on another cube, it produces an acceleration three times greater than the first case.

Deduce the relationship between the masses of the two cubes.

- The end -

Chapter 3 | Newton's Second Law – Newton's Third Law

Group (A)

First: Multiple Choice Questions

- 1) The mathematical form of Newton's Second Law can be written in all of the following ways except:

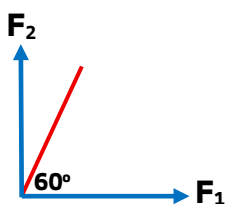
(A) $F = m \Delta v / \Delta t$ (B) $F = ma$ (C) $F = \Delta p / \Delta t$ (D) $F_1 = -F_2$

- 2) A body of mass **2 kg** moves under the action of a **6 N** force, and the frictional force acting on it is **2 N**.

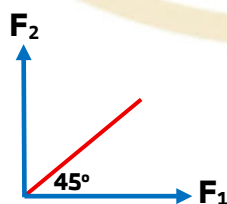
The acceleration of the body is:

(A) 6 m/s^2 (B) 2 m/s^2 (C) 3 m/s^2 (D) 4 m/s^2

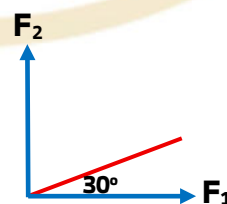
- 3) According to Newton's Third Law, the correct graphical relationship between the magnitude of the action force (F_1) and the reaction force (F_2), when both are drawn using the same scale, is:



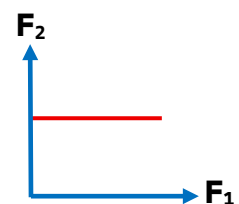
(D)



(C)



(B)



(A)

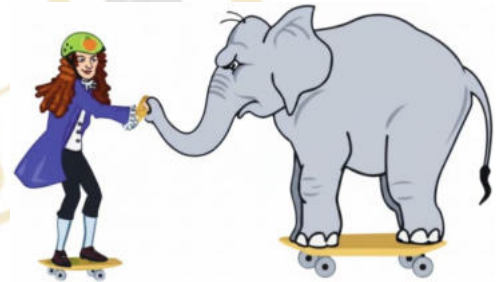
4) The motion of birds during flight is one of the most common examples of which law?

- (A) Newton's First Law (B) The Law of Inertia
(C) Newton's Second Law (D) Newton's Third Law

Second: Essay Questions

5) In the opposite figure, a man is pushing an elephant, and both are standing on movable wooden platforms. As a result, each moves in the opposite direction of the other.

- (1) What is the relationship between the force acting on the elephant and the force acting on the man?
(2) Why are the two forces not balanced?
(3) If the mass of the elephant is **100** times the mass of the man, compare the accelerations of their motions.



Group (B)

First: Multiple Choice Questions

1) The mathematical form of Newton's Third Law can be written in all of the following ways except:

(A) $m_1 \Delta v_1 / \Delta t = m_2 \Delta v_2 / \Delta t$

(B) $m_1 a_1 = -m_2 a_2$

(C) $F_1 \Delta v_1 / \Delta t = F_2 \Delta v_2 / \Delta t$

(D) $F_1 = -F_2$

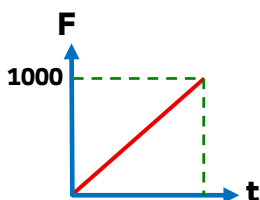
2) A car of mass **15,000 kg** has an engine force of $3 \times 10^4 \text{ N}$ and moves with non-uniform velocity on a rough road.

Its acceleration will be:

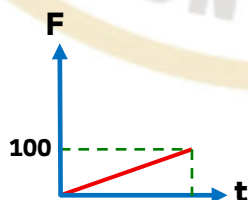
(A) greater than 2 m/s^2 (B) less than 2 m/s^2 (C) equal to 2 m/s^2 (D) equal to zero

3) A person of mass **70 kg** pushes an elephant of mass **7000 kg**.

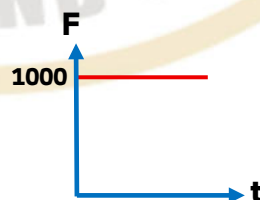
If the person exerts a constant force of 100 N on the elephant, then the elephant exerts on the person a reaction force (**F**) that can be represented graphically by the relation:



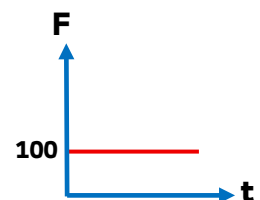
(D)



(C)



(B)



(A)

4) A cannon does not recoil with the same speed as the projectile moves forward because:

- (A) the cannon is fixed in position
- (B) action and reaction forces are opposite in direction
- (C) the inertial masses of the cannon and the projectile are different
- (D) action and reaction are unbalanced forces

Second: Essay Questions

5) In the opposite figure, a man is rowing a boat in a river:

- (1) Identify the action and reaction forces in this situation.
- (2) Explain why the two forces are not balanced.
- (3) If the oars push the water with a force of **50 N**, calculate the acceleration of the boat if its total mass (boat + man) is **250 kg**.



Group (C)

First: Multiple Choice Questions

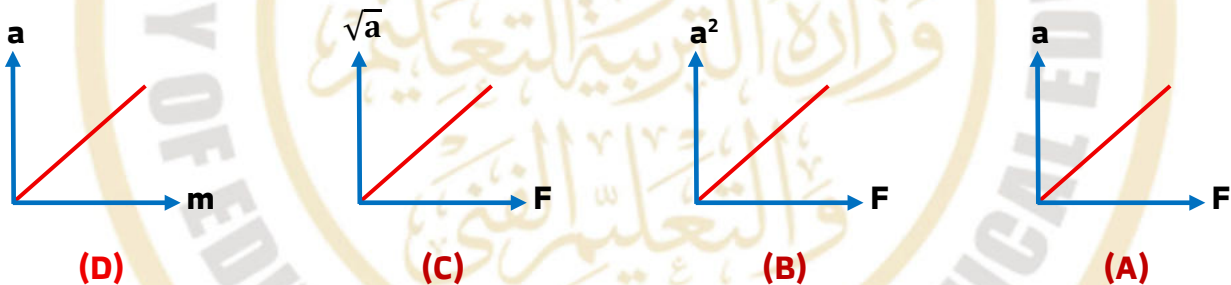
1) The mathematical expression of Newton's Third Law can be written as:

- (A) $F_1 = -F_2$ (B) $F = ma$ (C) $\Sigma F = 0$ (D) $\Sigma F \neq 0$

2) The force required to accelerate a body of mass 10 kg such that its speed changes from **54 km/h to 108 km/h** in **10 seconds** equals:

- (A) 10 N (B) 5 N (C) 15 N (D) 30 N

3) The graphical relationship that correctly represents Newton's Second Law is:

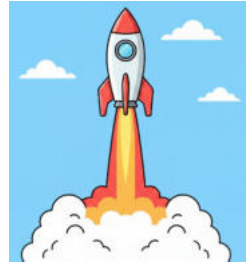


4) In the opposite figure, the force that causes the cart to move forward is:

- (A) the force exerted by the man on the cart
(B) the force exerted by the cart on the man
(C) the force exerted by the ground on the cart
(D) the force exerted by the ground on the man

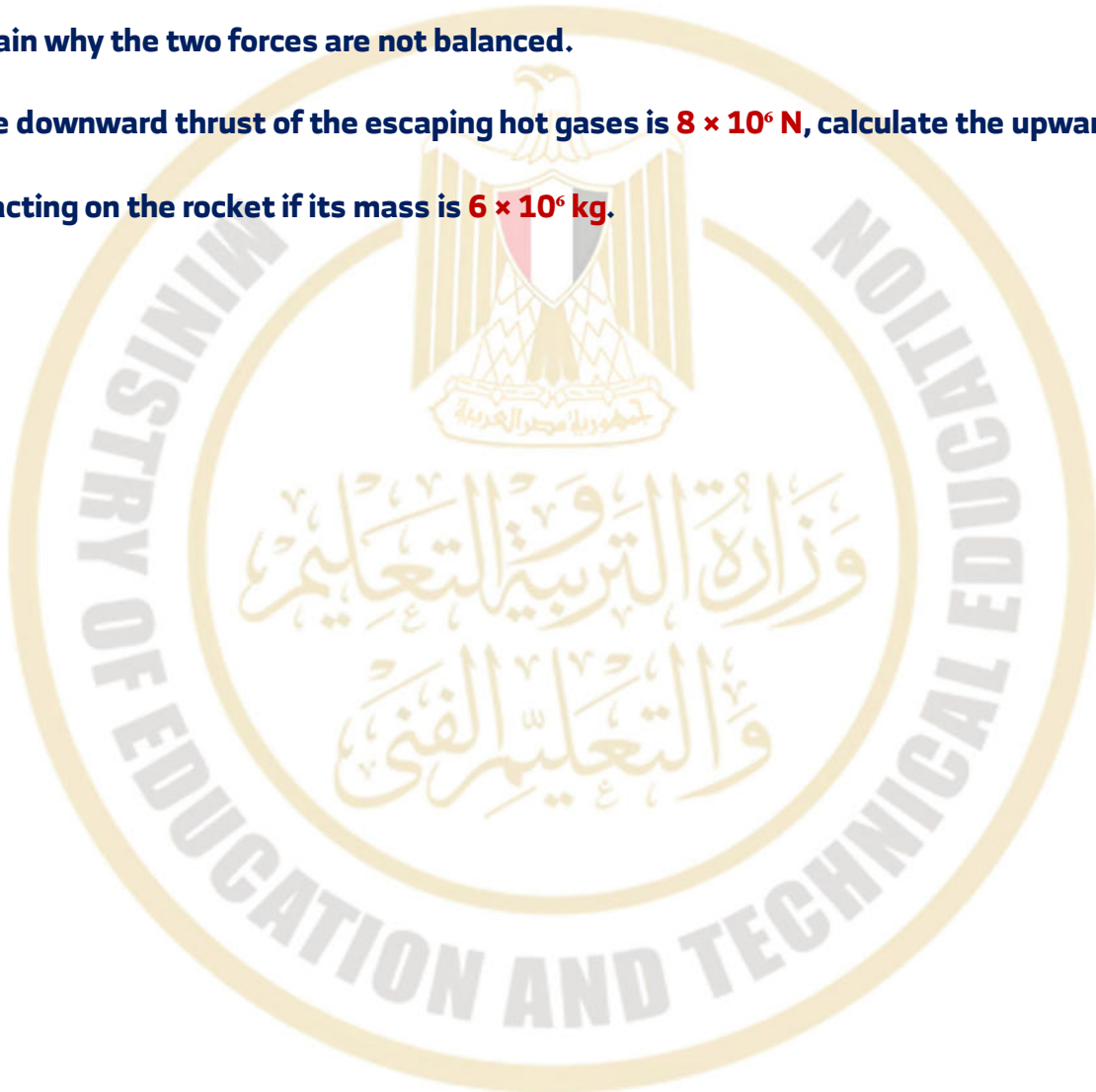


Second: Essay Questions



5) In the opposite figure, a rocket is launched upward:

- (1) Identify the action and reaction forces in this situation.
- (2) Explain why the two forces are not balanced.
- (3) If the downward thrust of the escaping hot gases is $8 \times 10^6 \text{ N}$, calculate the upward thrust (force) acting on the rocket if its mass is $6 \times 10^6 \text{ kg}$.





Physics

Second Secondary Grade

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Home Work

Week



Name:

Class:

School:

إعداد

محمد عشر - عبد الله مصطفى

حسن أشرف

مراجعة

مجدي فتحي - عمرو مالي

مكتب مستشار العلوم

عبدالله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

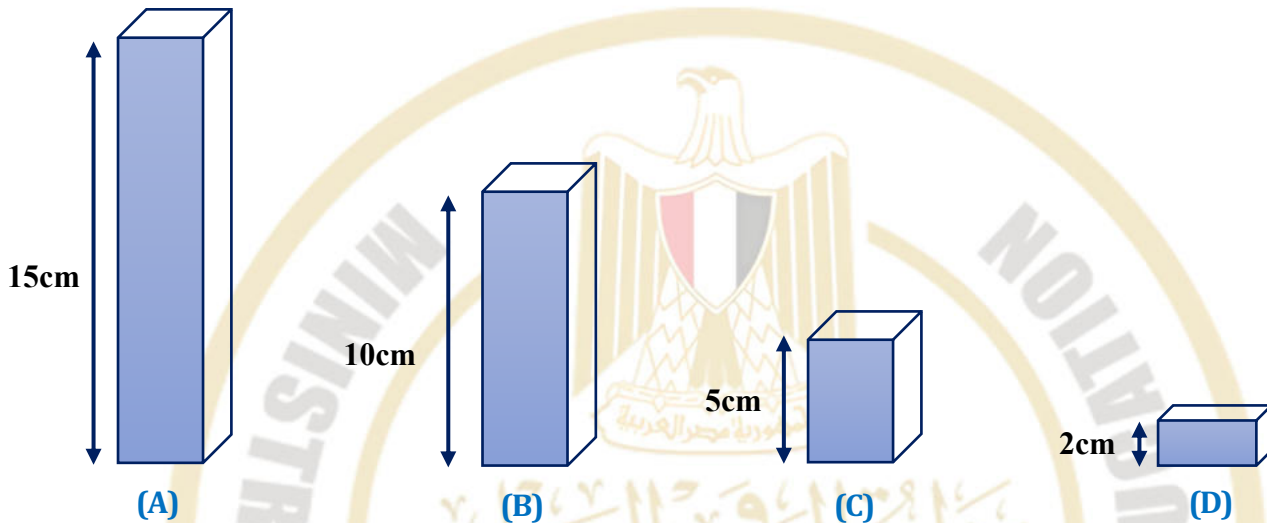
إشراف عام

د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام

Chapter 4| Density

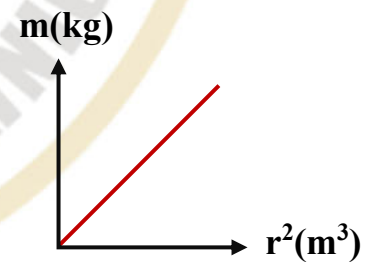
First: Multiple Choice Questions

- 1) The graph shows four blocks, each made of glass with a density of 2.6 g/cm^3 . The base area of each block is 1 cm^2 . Which shape has a mass of 13 g ?



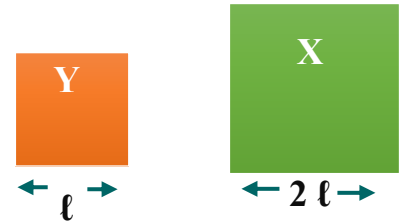
- 2) The graph shows the relationship between the mass (m) and the square of the base radius (r) for a number of solid copper cylinders all of which have the same height (h). The density of copper =

- (A) slope of the graph
- (B) (slope of the graph)/(πh)
- (C) (πh)/(slope of the graph)
- (D) (slope graph)/($\pi^2 h$)



3) In the figure, there are two cubes of different materials with the same mass. The relationship between the density of each of them is

- (A) $\rho_y = 2 \rho_x$
- (B) $\rho_y = 4 \rho_x$
- (C) $\rho_y = 0.5 \rho_x$
- (D) $\rho_y = 8 \rho_x$



4) Two balls (A, B) The mass of ball (A) is three times the mass of ball (B), and its radius is equal to the diameter of ball (B). Then the ratio of the density of ball (A) to the density of ball (B) (ρ_A/ρ_B) is equal to:

- (A) 3/8
- (B) 5/3
- (C) 2/3
- (D) 8/3

5) When measuring the density of equal volumes of different blood samples, if the density of blood for a healthy person is 1060 kg/m^3 and the volume of the blood sample is $2.076 \times 10^{-5} \text{ m}^3$, then the blood sample for a person with anemia is

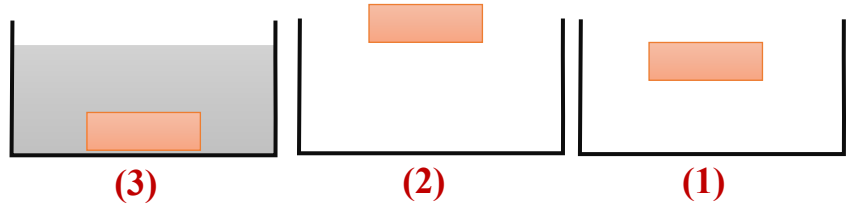
- (A) (1)
- (B) (2)
- (C) (3)
- (D) (4)

Sample	1	2	3	4
Mass (gm)	21	22	23	24

- 6) Three identical copper cubes were placed inside three different liquids as shown in the figure.

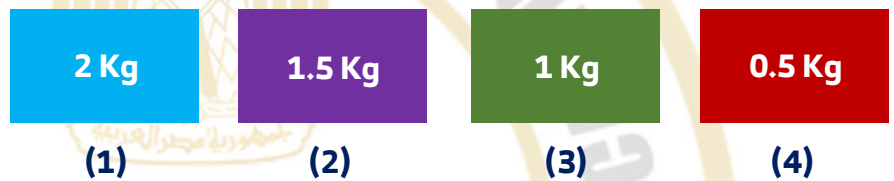
When calculating the density of each liquid, we get

- (A) $\rho_{(1)} > \rho_{(2)} > \rho_{(3)}$
 (B) $\rho_{(3)} > \rho_{(1)} > \rho_{(2)}$
 (C) $\rho_{(1)} > \rho_{(3)} > \rho_{(2)}$
 (D) $\rho_{(2)} > \rho_{(1)} > \rho_{(3)}$



- 7) The opposite figure represents four equal volumes of different objects 1, 2, 3, 4. Which object has the highest relative density?

- (A) (1)
 (B) (2)
 (C) (3)
 (D) (4)



- 8) An empty container has a mass of **10 kg**. When it was completely filled with water, its mass became **17 kg**. Then it was emptied and filled with another liquid, so the mass of the container with the liquid became **20 kg**. The relative density of the liquid is.

- (A) 1.34
 (B) 1.71
 (C) 1.22
 (D) 1.43



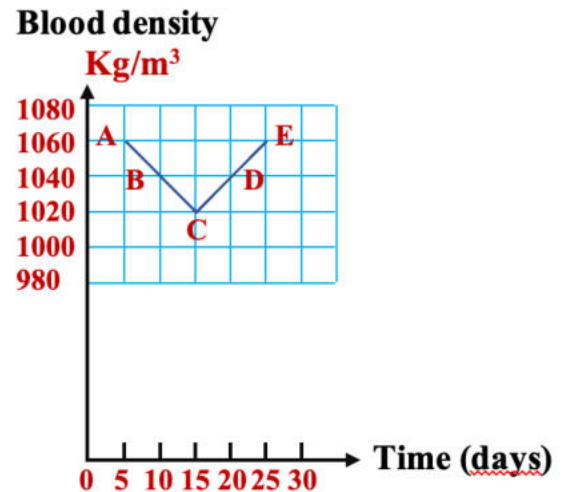
9) In the laboratory for testing the concentration of salts in urine, the results for four people were as follows. Which of the above people has increased salts in the urine?

- (A) Person (D)
- (B) Person (B)
- (C) Person (A)
- (D) Person (C)

Person	A	B	C	D
$(\text{Kg/m}^3)\rho_{\text{urine}}$	1020	1030	1010	1019

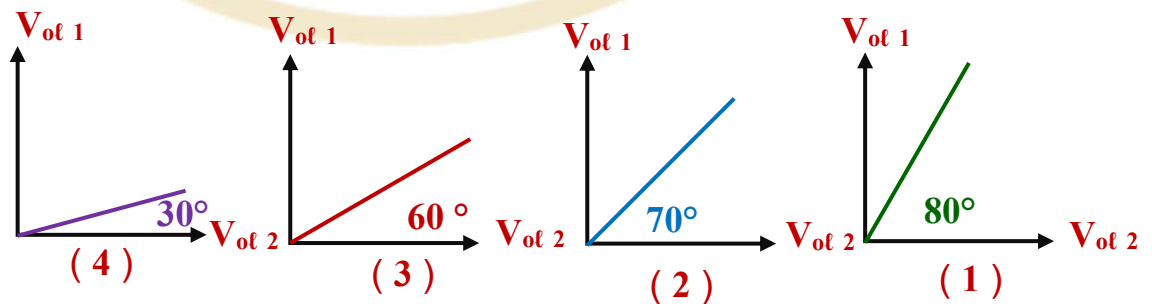
10) The graph shows the variation in blood density of a person under normal observation over a period of 30 days. Which periods indicate that the person is suffering from anemia?"

- (A) AB, DE
- (B) CD, BC
- (C) AB, CD
- (D) BC, DE



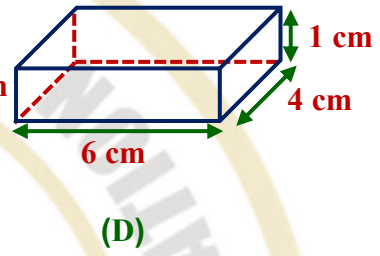
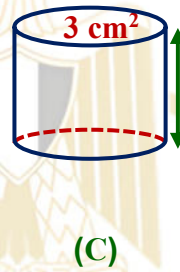
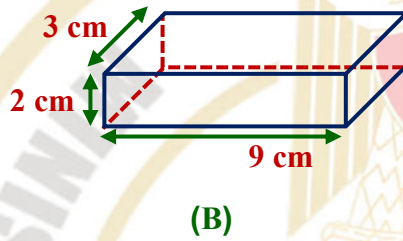
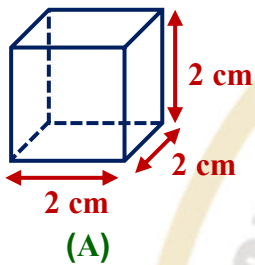
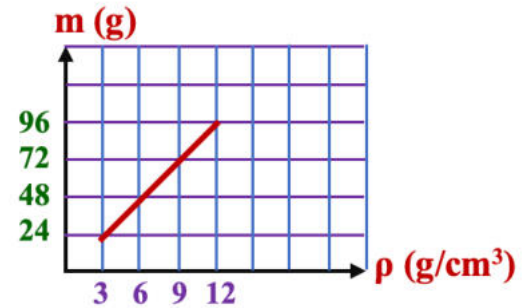
11) You have four graphs that represent the relationship between the volumes of equal masses of different substances (V_{ot1}) and the volumes of the same masses of water (V_{ot2}). The substance with the highest relative density is.....

- (A) 1
- (B) 2
- (C) 3
- (D) 4



12) **The opposite graph:** represents the relationship between mass and density for a number of different materials when the volume is constant. Which of the following graphs represents the volume of one of these materials?

- (A) A
- (B) B
- (C) C
- (D) D



Second: Essay Questions

13) Calculate the density and relative density of aluminum if a volume of 0.1 m^3 has a mass of 270 kg .

14) A cylindrical aluminum container with a thick wall has a mass of 5 kg when empty. Its height is 30 cm and its inner radius is 20 cm . Calculate the mass of the oil that completely fills the container.

Given that:

Density of aluminum = 2700 kg/m^3

Density of oil = 800 kg/m^3

- The end -



Chapter 4| Density

Group (A)

First: Multiple Choice Questions

- 1) The volume of **50 g** of kerosene is **60.9 cm³**. the density and relative density are,, respectively.
- (A) 0.82 g/cm³ , 0.82
(B) 0.90 g/cm³ , 0.9
(C) 1.00 g/cm³ , 1
(D) 1.20 g/cm³ , 1.2
- 2) A container has a mass of **10kg** when empty. When filled with water, its total mass becomes **60kg**, and when filled with oil, its total mass becomes **50kg**.
Given that the density of water is **1000 kg/m³**, the relative density and density of the oil are:
- (A) 0.8 and 800 kg/m³
(B) 0.9 and 900 kg/m³
(C) 0.7 and 700 kg/m³
(D) 1.2 and 1200 kg/m³
- 3) Given that the density of copper = **8700 kg/m³** and the density of water = **1000 kg/m³**, which of the following choices is correct?

	Relative density	Volume	Mass
(A)	8.7	200 cm ³	17.4 kg
(B)	8.7	20 cm ³	0.174 kg
(C)	0.87	2.0 cm ³	1740 kg
(D)	870	0.02 m ³	174 g



- 4) A cube has a side length of **20 cm** and a mass of **76.8 kg**.

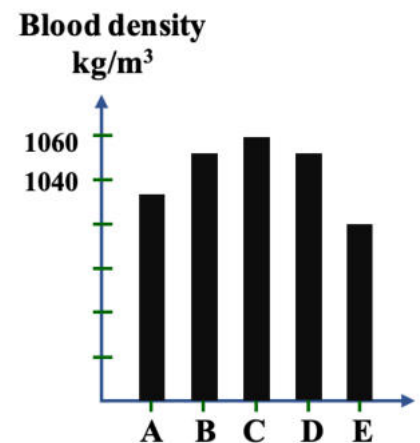
Calculate the density and relative density of the cube, given that the density of water is **1000 kg/m³**.

- (A) 9600 kg/m³ and 9.6
- (B) 900 kg/m³ and 0.9
- (C) 760 kg/m³ and 0.76
- (D) 10,000 kg/m³ and 10

Second: Essay Questions

- 5) The figure shows the blood density of a number of people (**A, B, C, D, E**). The following is true:

- a) The person who is least affected by anemia is
- b) The person who is most affected by anemia is



Group (B)

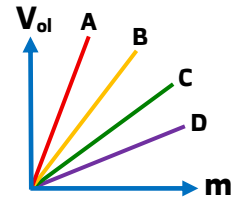
First: Multiple Choice Questions

- 1) Two equal volumes of iron and aluminum have a difference in mass of **12.75 kg**.
If the ratio of their densities (iron: aluminum) is **26/9**, the mass of each metal is:
- (A) Iron = 19.5 kg and Aluminum = 6.75 kg
(B) Iron = 20.8 kg and Aluminum = 8.05 kg
(C) Iron = 26.0 kg and Aluminum = 13.25 kg
(D) Iron = 17.0 kg and Aluminum = 4.25 kg
- 2) A barrel can hold **90 kg** of water or **60 kg** of gasoline. If the density of water is **1000 kg/m³**, then the density and relative density of gasoline, are:
- (A) 667 – 0.667 kg/m³
(B) 0.667 – 667 kg/m³
(C) 0.9 – 900 kg/m³
(D) 0.6 – 600 kg/m³
- 3) Two metallic spheres, the first has a radius (**r**) and density (**ρ**) and the second has a radius (**2r**) and density (**2 ρ**). The ratio between their masses equals
- (A) 1/4
(B) 1/2
(C) 1/8
(D) 1/16
- 

Ball (2) Ball (1)

4) The following graph shows the relationship between volume and mass for several solid pieces made of different materials. The correct relationship expressing the densities of the materials is:

- (A) $\rho_A > \rho_B > \rho_C > \rho_D$
- (B) $\rho_D > \rho_C > \rho_B > \rho_A$
- (C) $\rho_A = \rho_B = \rho_C = \rho_D$
- (D) $\rho_A = \rho_B > \rho_C = \rho_D$



Second: Essay Questions

5) A cube of iron has a side length of **12 cm** and a mass of **7 kg**. Given that the density of iron = **7800 kg/m³**, determine whether this cube is solid or contains cavities (air gaps). Explain your answer.

Group (C)

- 1) An empty container has a mass of **190 g**.
 When filled with a liquid of relative density **0.81**, the total mass of the container and the liquid becomes **400 g**.
 If the same container is filled with water (density = **1 g/cm³**), the total mass of the container and the water will be approximately:
- (A) 299 g
 - (B) 349 g
 - (C) 399 g
 - (D) 449 g

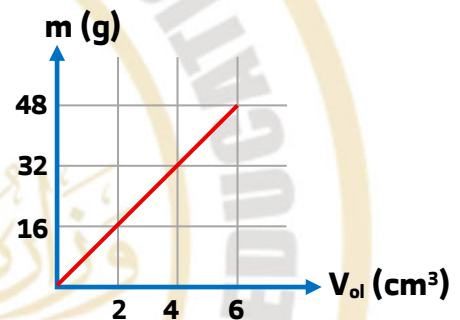
2) The ratio of the density of the electrolyte solution in a car battery after the battery is discharged to its density after the battery is recharged is:

- (A) Greater than one
- (B) Less than one
- (C) Equal to one
- (D) May be greater or less than one

3) The following graph: shows the relationship between the masses of several pieces of a certain metal and their volumes.

Given that the density of water = 1000 kg/m^3 , the relative density of the metal equals:

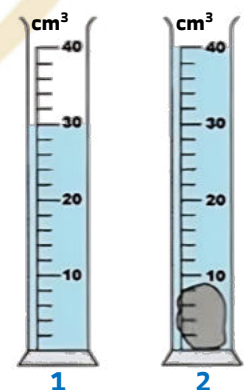
- (A) 8000
- (B) 1000
- (C) 8
- (D) 1



4) Figure (1) shows a graduated cylinder containing a certain amount of water, while Figure (2) shows the same cylinder after adding a metal piece of mass 25 g.

The density of the metal equals:

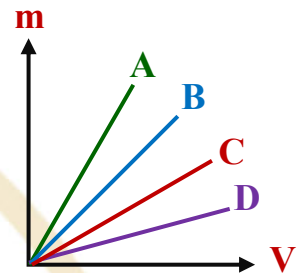
- (A) 2500 g/cm^3
- (B) 2.5 kg/m^3
- (C) 2500 kg/m^3
- (D) 2.5 g/cm^3



Second: Essay Questions

5) The following graph shows the relationship between the mass and volume of a quantity of blood for four persons suffering from anemia.

Which of these persons has the highest level of anemia? Explain your answer.



- The end -



Physics

Second Secondary Grade

20
26

Home Work

Week



Name:

Class:

School:

إعداد

عبد الله مصطفى - حسن أشرف

مراجعة

محمد عنتر - مجدي فتحي
عمرو مالي

مكتب مستشار العلوم

عبد الله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

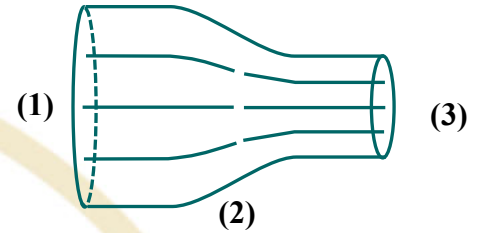
د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام

Chapter 4| Hydrodynamics

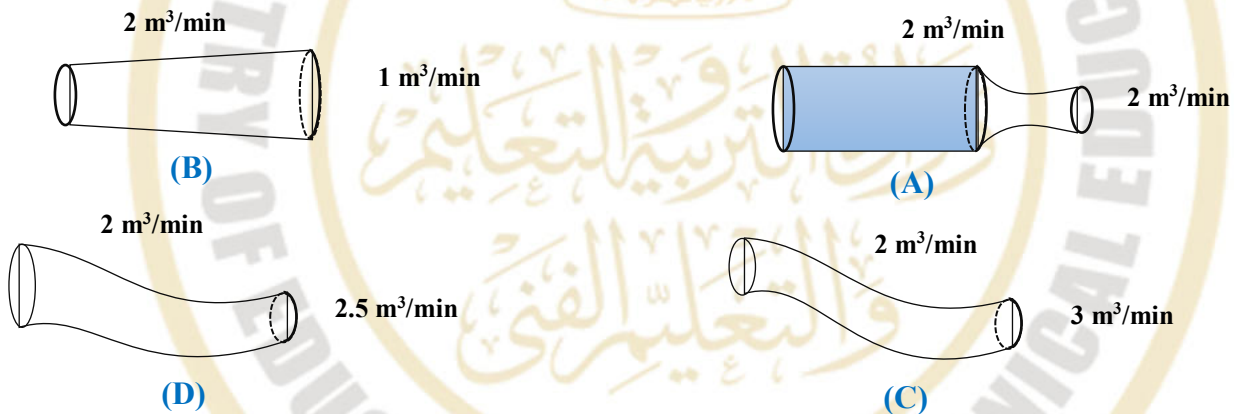
First: Multiple Choice Questions

1) The figure shows a flow tube through which the liquid flows in a laminar (**streamline**) flow. Then:

- (A) The mass flow rate at (1) has the greatest value
- (B) The mass flow rate at (2) has the greatest value
- (C) The mass flow rate at (3) has the greatest value
- (D) The mass flow rates are equal at all points



2) From the figures given, determine which one represents **laminar flow**?



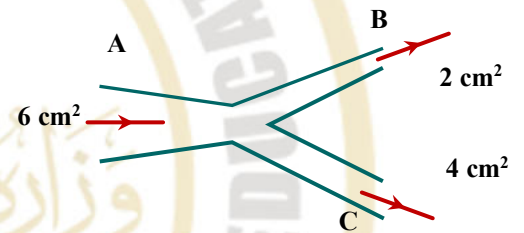


3) In **steady flow** of liquids, the ratio between the number of streamlines passing through the wide section of the tube to the number of streamlines passing through the narrow section of the same tube equals

- (A) Greater than one
- (B) Equal to one
- (C) Less than one
- (D) Equal zero

4) In the adjacent figure represents a tube with water flowing in **steady flow**:
If the velocity of water at **A** and **C** is **8 m/s** and **4 m/s** respectively, then its velocity at **B** is:

- (A) 6 m/s
- (B) 8 m/s
- (C) 12 m/s
- (D) 16 m/s



5) A liquid flows through a tube of uniform diameter (**X**) with velocity (**v**). If a cork stopper is placed at the end of the tube, and the diameter of the hole in the cork is equal to **X/4**, then the velocity of the liquid emerging through the hole in the cork equals

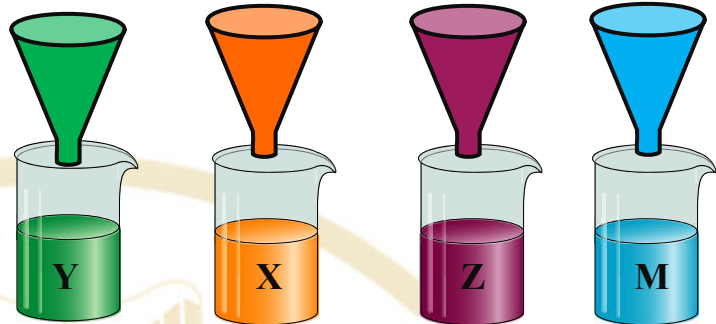
- (A) $16 v$
- (B) $4 v$
- (C) $1/4 v$
- (D) $1/16 v$

6) The figure shows equal quantities of different liquids poured into identical funnels.

Given that viscosity: $M > Z > X > Y$

Which liquid collects in the container first?

- (A) Liquid M
- (B) Liquid Y
- (C) Liquid X
- (D) Liquid Z

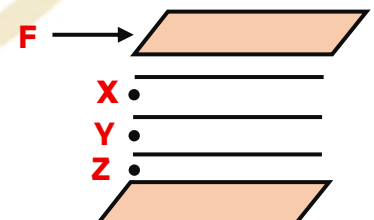


7) Can water be used for lubricating metallic machines?

- (A) Yes, because it is a low-cost liquid and it cools the machine parts.
- (B) No, because its viscosity is low and it causes corrosion of metals.
- (C) Yes, because it adheres to the machine parts, fully covering and protecting them from corrosion.
- (D) No, because liquid water cannot be used for cooling metals.

8) A liquid is confined between two parallel plates. A tangential force is applied to the upper plate to move it, so the **velocity** of the points shown in the figure will be as follows:

- (A) $V_Z < V_Y < V_X$
- (B) $V_Z = V_Y = V_X$
- (C) $V_Z < V_Y = V_X$
- (D) $V_Z > V_Y > V_X$



- 9) Four identical metallic balls are fallen down from the same height, each ball toward a separate jar where each jar contains a different liquid from the other jars then the taken time by each ball to reach the bottom of the jar is recorded in each case as the following:

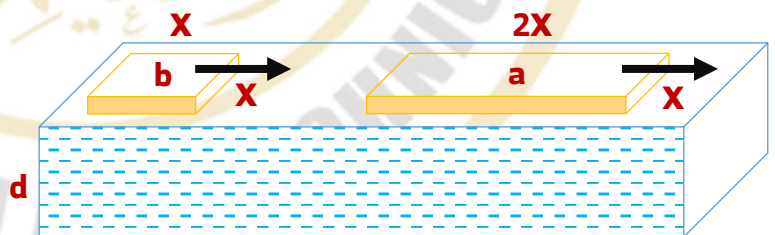
The jar	The time taken by the ball to reach the bottom
1	0.2 s
2	0.3 s
3	0.6 s
4	1 s

Which jar contains the liquid with **higher** viscosity?

- (A) Jar 1
- (B) Jar 2
- (C) Jar 3
- (D) Jar 4

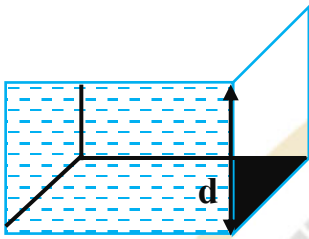
- 10) Two plates, **a** and **b** move on the surface of a liquid with the same velocity. The ratio between the forces F_a/F_b is equal to the ratio:

- (A) 2/1
- (B) 1/1
- (C) 4/1
- (D) 1/2

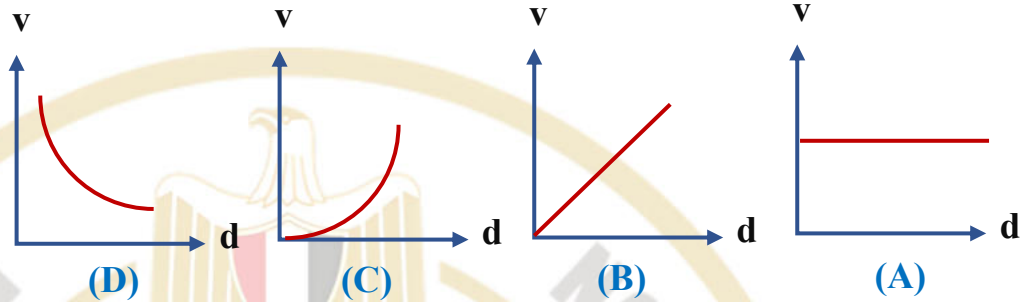


- 11) The figure represents a sample of a liquid confined between two plates: the lower plate (**stationary**) and the upper plate (**moving**). Which of the following graphs represents the relationship between the velocity of flow of each liquid layer (**v**) and the depth of that layer (**d**)?

The upper plate (moving)



The lower plate (stationary)



Second: Essay Questions

- 12) Three taps are used to fill a tank. the first fills the tank in **1 hour**, the second fills the tank in **1/2 hour** and the third fills the tank in **1/4 hour**. Calculate the time required to fill the tank if all three taps are opened at the same moment.
- 13) A main artery of an adult person has a cross-sectional area of **3 cm²** and a blood flow velocity of **30 cm/s**. The blood is distributed into a number of capillaries, each having a cross-sectional area of **3×10⁻⁵ m²** and a velocity of **0.05 cm/s**. Calculate the number of capillaries.

**Chapter 4| Hydrodynamics****Group (A)****First: Multiple Choice Questions**

- 1) A tube of diameter **10 cm** ends with a diameter **2.5 cm**. If the velocity of water in the wide section of the tube is **1 m/s**.

Given that the density of water is **1000 kg/m³**

	The velocity of water at the end.	The mass of water flowing per minute through any cross-section of the tube.
(A)	4 m/s	118 kg
(B)	8 m/s	235 kg
(C)	16 m/s	472 kg
(D)	25 m/s	785 kg

- 2) In a **steady flow**, if the radius of a tube is doubled, the mass flow rate

- (A) Doubles
- (B) decreases to a quarter
- (C) remains constant
- (D) decreases to half



- 3) If the cross-sectional area of a tube in which a liquid flows steady increases to double, the volume flow rate
- (A) Doubles
 - (B) decreases to a quarter
 - (C) remains constant
 - (D) decreases to half
- 4) When measuring the speed of a liquid in a pipe, the value of the speed at a certain point at that moment was **8 m/s**, and at another moment at the same point the speed became **9 m/s**, then the type of flow is
- (A) Turbulent flow
 - (B) Steady flow
 - (C) Steady then turbulent flow
 - (D) Turbulent then steady flow

Second: Essay Questions

- 5) In human body, why is the speed of flow of blood in the major artery **greater than** its speed in blood capillaries although the area of capillary is less than the area of artery?

Group (B)

First: Multiple Choice Questions

- 1) The ratio between the sedimentation rate of red blood cells in **anemia** patients and in **rheumatic fever** patients is
- (A) Less than one
(B) Equal one
(C) Greater than one
(D) less or greater than one
- 2) Water flows steadily through a pipe of radius **4 cm** with a speed of **2 m/s**.
The volume of the liquid that flows in one minute is m^3
- (A) 0.151
(B) 0.302
(C) 0.452
(D) 0.603
- 3) If you know that the volume flow rate of a liquid is **$2 \times 10^2 \text{ m}^3/\text{s}$** and the mass flow rate is **$2 \times 10^5 \text{ kg/s}$** , then its density is kg/m^3
- (A) 500
(B) 750
(C) 1000
(D) 1500



4) You have four wooden plates of different areas where $A_1 > A_2 > A_3 > A_4$.

They are placed on the surface of the same liquid, and each is to be moved with the same speed.

If the depth of the liquid is the same, which of the following represents the correct order of the force required to move them?

- (A) $F_1 > F_2 > F_4 > F_3$
- (B) $F_1 > F_4 > F_2 > F_3$
- (C) $F_1 > F_3 > F_2 > F_4$
- (D) $F_1 > F_2 > F_3 > F_4$

Second: Essay Questions

5) A surface layer of a liquid of area 2 m^2 moves with a velocity of 2 m/s due to the action of a tangential force of 4 N , while the stationary layer of the liquid lies at a depth of 2 cm below the surface.

Calculate:

- (a) The coefficient of viscosity of the liquid.
- (b) The force required for the moving layer to reach double the speed.

Group (C)

1) A certain mass flow rate of two different liquids passes through two flow tubes.

The ratio of their densities is $1/4$, and the volume of the first liquid is twice that of the second. If the mass flow rate is constant, then the ratio t_1/t_2

- (A) $1/2$
- (B) $2/1$
- (C) $1/4$
- (D) $4/1$

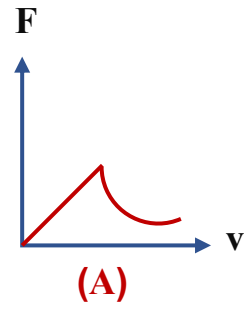
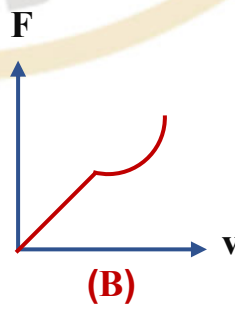
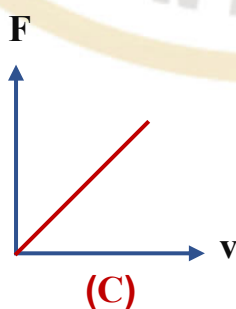
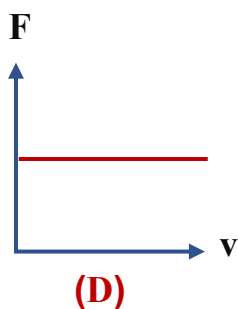
2) When performing an erythrocyte sedimentation rate (ESR) test for three persons. The first suffering from **rheumatic fever**, the second from **anemia**, and the third being **healthy**. the final sedimentation rate of the red blood cells will be:

- (A) Equal in all three persons
- (B) Greatest in the second person
- (C) Greatest in the first person
- (D) Greatest in the third person

3) A car starts from rest and its speed increases until it exceeds 120 km/h .



Which of the following graphs correctly represents the relationship between speed and air resistance?





4) A liquid flows through a tube with a speed v .

If its speed increases to $2v$, the ratio r_2/r_1 is

- (A) $1/2$
- (B) $\sqrt{2}/1$
- (C) $2/1$
- (D) $1/\sqrt{2}$

Second: Essay Questions

5) A circular plate of diameter 140 cm slides with a speed of 0.1 m/s on a layer of viscous liquid of thickness 2.5 mm and coefficient of viscosity $2.5\text{ kg/(m}\cdot\text{s)}$.
Calculate the tangential force acting on the plate.

(Given that $\pi = 22/7$)

- The end -



Physics

Second Secondary Grade

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Home Work

Week

Name:

Class:

School:

إعداد

عبد الله مصطفى - حسن أشرف

مراجعة

محمد عنتر - مجدي فتحي
عمرو مالي

مكتب مستشار العلوم

عبد الله مصطفى - سعيد محمد

إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام

Chapter 4| Pressure**First: Multiple Choice Questions**

1) If you know that the unit of force is **the newton** and it is equal to **kg. m/s²**. Which of the following units is used to measure **pressure**?

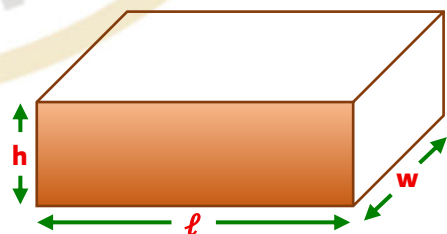
- (A) kg . m⁻². s⁻¹
- (B) kg . m⁻². s⁻²
- (C) kg . m⁻¹. s⁻²
- (D) kg . m⁻¹.s⁻¹

2) A tangential force of **200 N** affected the upper surface of a cube with a side length of **10 cm**. The resulting pressure is equal to

- (A) $2 \times 10^4 \text{ N/m}^2$
- (B) $2 \times 10^5 \text{ N/m}^2$
- (C) $2 \times 10^3 \text{ N/m}^2$
- (D) Zero

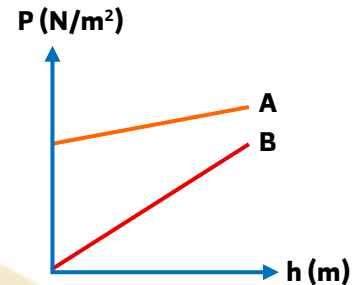
3) A cuboid with dimensions (**ℓ**, **w**, **h**) is placed on a horizontal surface as shown in the figure. The maximum pressure exerted on the surface can be calculated from the relationship

- (A) $P_{\max} = F_g/(w.h)$
- (B) $P_{\max} = \rho.w.g$
- (C) $P_{\max} = F_g/(L.w)$
- (D) $P_{\max} = \rho.h.g$

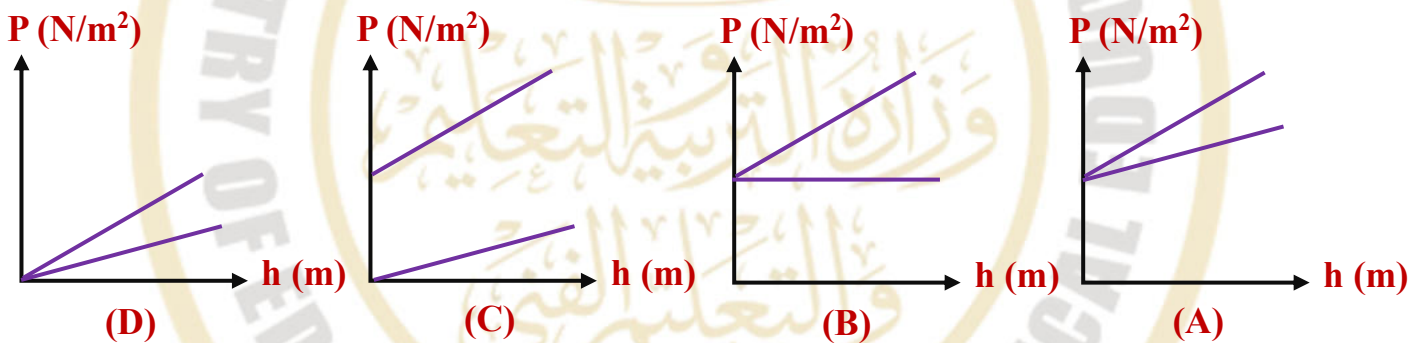


- 4) The graph represents the relationship between the pressure at a point in the two different fluids **A**, **B** and the depth of this point in the fluids. Which of the following choices is correct?

- (A) $\rho_{(A)} > \rho_{(B)}$, A is exposed to air .
 (B) $\rho_{(A)} > \rho_{(B)}$, A is not exposed to air
 (C) $\rho_{(A)} < \rho_{(B)}$, A is exposed to air
 (D) $\rho_{(A)} < \rho_{(B)}$, A is not exposed to air

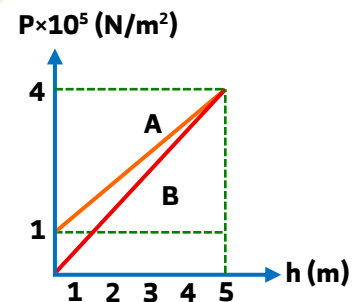


- 5) Two identical tanks containing two liquids. The density of the liquid in the second tank is **greater than** the density of the liquid in the first tank. The first tank is closed and the second tank is open. The graph shows the pressure (**P**) and the depth (**h**). The ...



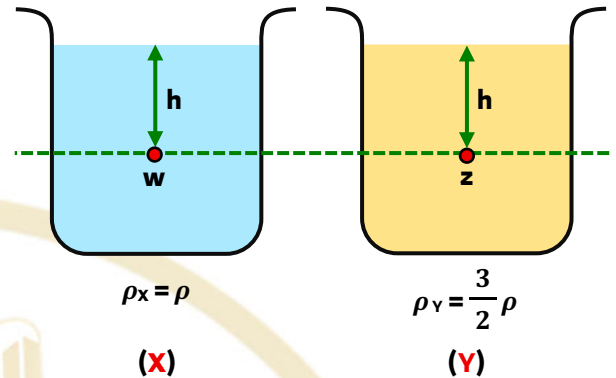
- 6) In the given graph: **A** and **B** are two different liquids. The ratio between density of liquid **B** and density of liquid **A** is:

- (A) 5/4
 (B) 4/5
 (C) 4/3
 (D) 3/4



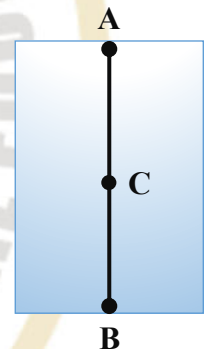
7) Two identical tanks containing two liquids (**X**, **Y**) of different densities, the relationship between the pressure at (**w**) and the pressure at (**z**) on the same horizontal level is

- (A) $P_w = P_z$
- (B) $3P_w = 2P_z$
- (C) $2P_w = 3P_z$
- (D) $P_w = 1/2 P_z$



8) The figure represents a part of the fluid pressure at point **A** located at the surface is **R** where **R** represents the atmospheric pressure and the pressure difference between **A**, **B** is equal to **3R**, and point **C** is located in the middle of the vertical distance between **A**, **B**. The value of the pressure at point **C** is equal to.

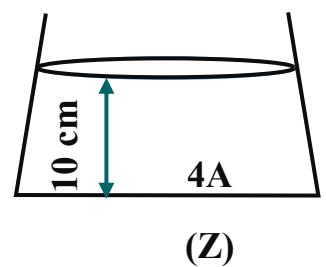
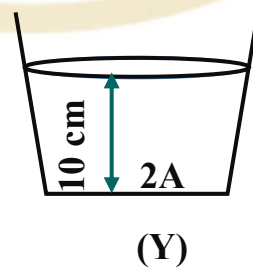
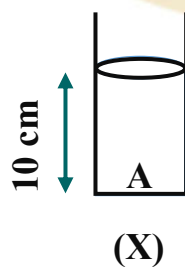
- (A) $(5 R)/2$
- (B) $(3 R)/2$
- (C) $3 R$
- (D) $2 R$



9) In the figure shown, three vessels are filled with water.

The ratio of the force of the water on the base is, in the order **F_X**: **F_Y**: **F_Z**, which is

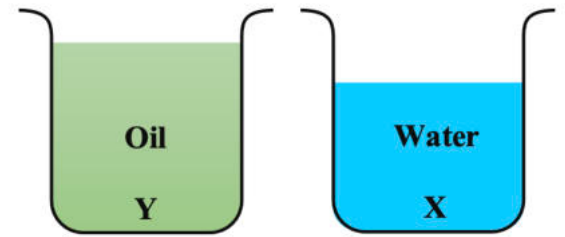
- (A) 10: 20: 15
- (B) 4: 2: 1
- (C) 1: 2: 2
- (D) 1: 2: 4



- 10) Two identical tanks, each with a cross-sectional area of A , fill the first with water and the volume of water is **0.6** of the volume of the tank, and fill the second with oil and the volume of oil is **0.7** of the volume of the tank. The ratio between (water pressure at point **X**)/ (oil pressure at point **Y**) is:

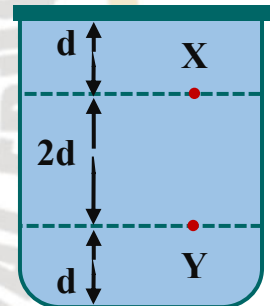
(Knowing that the $\rho_w = 1000 \text{ Kg/m}^3$ and $\rho_{oil} = 800 \text{ Kg/m}^3$)

- (A) 4/5
- (B) 2/25
- (C) 5/4
- (D) 15/14



- 11) In the given figure, a tank is filled with a certain liquid. If the pressure of the liquid at point (**X**) is **3** bar, then the pressure at point (**Y**) is

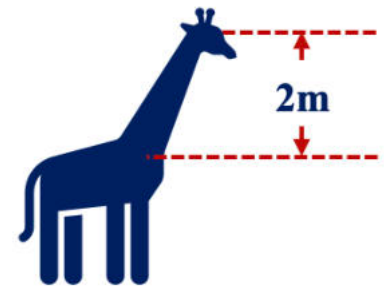
- (A) 9 bar
- (B) 4.5 bar
- (C) 6 bar
- (D) 12 bar



Second: Essay Questions

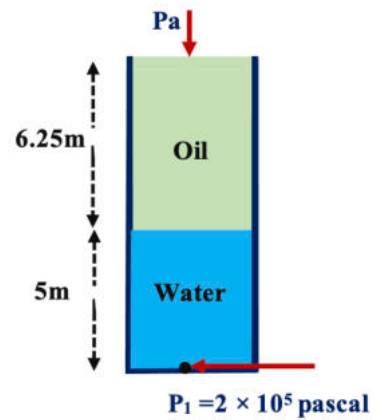
- 12) What is the pressure difference between the heart and the brain in a giraffe, if the brain is **2m** above the heart?

(Blood density **1060 kg/m³**, assuming constant blood velocity)



13) From the opposite figure, Calculate the pressure on the surface of the oil

Knowing that $\rho_{oil} = 800 \text{ Kg/m}^3$, $g = 10 \text{ m/s}^2$, $\rho_w = 1000 \text{ Kg/m}^3$.



14) A tank with dimensions $200 \text{ cm} \times 100 \text{ cm} \times 50 \text{ cm}$ is filled with water up to a height of 2 m . Calculate:

- (a) The pressure of the water on the bottom of the tank.
- (b) The force exerted by the water on the bottom of the tank.
- (c) The pressure of the water at a point 40 cm above the bottom.

-The end-

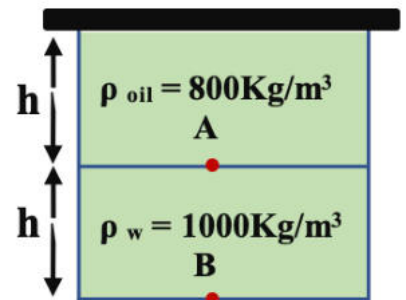
Chapter 4| Pressure

Group (A)

First: Multiple Choice Questions

- 1) A vessel contains a quantity of water and oil. The ratio between Pressure at point **A** and Pressure at point **B** is

- (A) 4/6
(B) 4/8
(C) 9/10
(D) 4/9



- 2) A wooden table has a top surface with dimensions **1.6 m × 2 m**. Calculate the force exerted by atmospheric pressure on the table's surface.

(Knowing that $P_a = 1.03 \times 10^5 \text{ N/m}^2$)

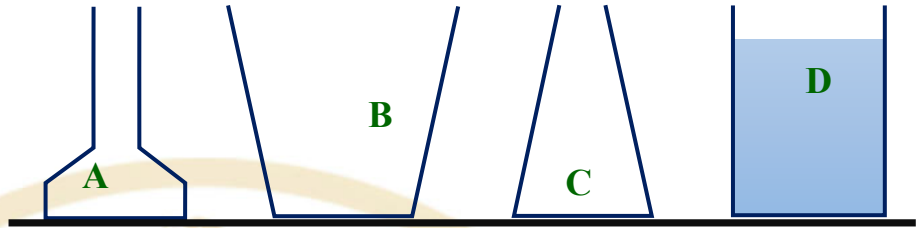
- (A) $1.013 \times 10^5 \text{ N}$
(B) $3.24 \times 10^5 \text{ N}$
(C) $0.317 \times 10^5 \text{ N}$
(D) $3.24 \times 10^5 \text{ N}$



3) A set of containers is filled with water as shown in the figure.

Which of the following represents the correct order of pressure at points **A**, **B**, **C**, and **D**?

- (A) $P_A > P_B > P_C > P_D$
- (B) $P_D > P_C > P_B > P_A$
- (C) $P_A > P_C > P_B > P_D$
- (D) $P_D > P_B > P_C > P_A$



4) A person is diving in a liquid with a density of 1030 kg/m^3 .

The maximum pressure that can be tolerated without eardrum rupture is $30.6 \times 10^4 \text{ N/m}^2$.

Given that atmospheric pressure (P_a) = $1.013 \times 10^5 \text{ N/m}^2$ and $g = 9.8 \text{ m/s}^2$,

the maximum depth the diver can reach is:

- (A) 10.11 m
- (B) 30.32 m
- (C) 20.28 m
- (D) 40.35 m

Second: Essay Questions

5) A solid cube and a solid rectangular block are made of the same material. The dimensions of the rectangular block are ($10 \text{ cm} \times 20 \text{ cm} \times 30 \text{ cm}$). When the block is placed on a table resting on the face ($20 \text{ cm} \times 30 \text{ cm}$), the pressure it exerts is three times the pressure exerted by the cube when placed on the same table. Calculate the side length of the cube.

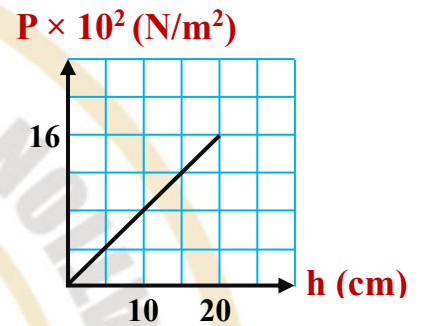
Group (B)

First: Multiple Choice Questions

- 1) The figure shows the relationship between the pressure at several points within the liquid and their depths.

Given that the acceleration due to gravity is $g = 10 \text{ m/s}^2$, the density of the liquid is:

- (A) 800 kg/m^3
- (B) 0.8 kg/m^3
- (C) 8000 kg/m^3
- (D) 0.16 kg/m^3

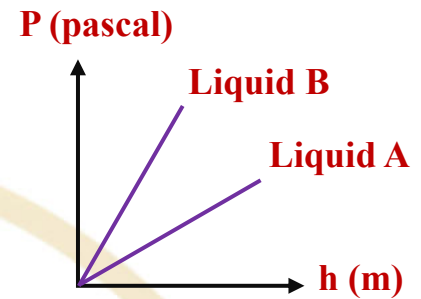


- 2) Two bodies (A, B) are placed at two different depths (15 cm, 20 cm) respectively in a closed container filled with water. The ratio between the pressure exerted on body B and the pressure exerted on body A is equal to

- (A) $4/3$
- (B) $3/4$
- (C) $5/4$
- (D) $4/5$

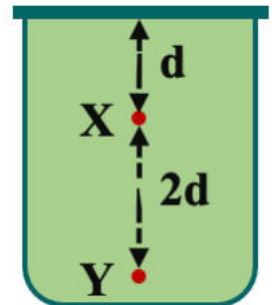
- 3) The graph shows the relationship between the pressure of two different liquids and the height of the liquid column (h) for two separate experiments. If the slope of straight-line **A** = 7900 and the slope of straight-line **B** = 9800. Which of the following choices is correct?

- (A) $\rho_B > \rho_A$
 (B) $\rho_A = 2\rho_B$
 (C) $\rho_A = 9.8 \rho_B$
 (D) $\rho_B = \rho_A$



- 4) A container holds a liquid, The ratio of the pressure at point **X** to the pressure at point **Y** is:

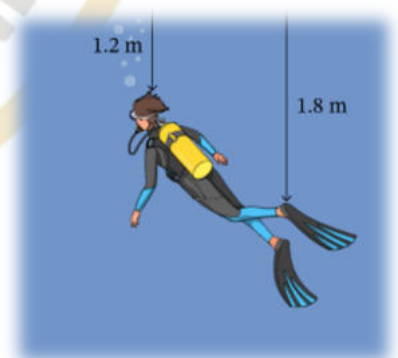
- (A) 2/1
 (B) 1/3
 (C) 1/2
 (D) 1/1



Second: Essay Questions

- 5) A diver swims in water with a density of **1015** kg/m³, as shown in the figure.

Calculate the difference in water pressure between the diver's head and feet.

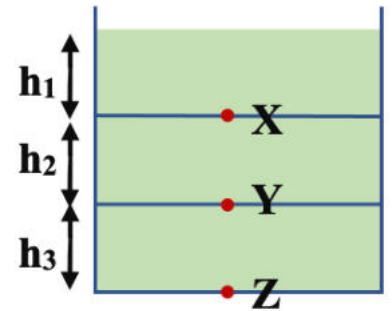


Group (C)

- 1) The figure shows containers filled with a liquid of density ρ , under gravitational acceleration g , and liquid heights $h_1 = h_2 = h_3$.

The pressures at points **X**, **Y**, and **Z** are:

- (A) $P_x > P_y > P_z$
- (B) $P_x = 3 P_z = 2 P_y$
- (C) $P_z > P_y > P_x$
- (D) $P_y = 2 P_z = 3 P_x$



- 2) At a point inside a liquid, the pressure:

- A) Acts only in the downward direction
- B) Acts equally in all directions and increases with depth
- C) Acts parallel to the surface of the liquid
- D) Decreases with the depth of the liquid

- 3) A submarine is designed to withstand a maximum pressure of $12.2 \times 10^5 \text{ N/m}^2$.

If the density of seawater is 1030 kg/m^3 , what is the maximum depth it can safely dive to?

Also, if the diameter of its hatch is 100 cm , what is the force acting on the hatch at that depth? (Take $g = 9.8 \text{ m/s}^2$)

- (A) Depth = 121 m , Force = $3.8 \times 10^6 \text{ N}$
- (B) Depth = 121 km , Force = $9.6 \times 10^5 \text{ N}$
- (C) Depth = 121 m , Force = $9.6 \times 10^5 \text{ N}$
- (D) Depth = 121 km , Force = $3.8 \times 10^6 \text{ N}$

- 4) A beaker contains mercury to a height of **5 cm**, above which there is a layer of water **10 cm** high, and on top of that, a layer of kerosene **2 cm** high.

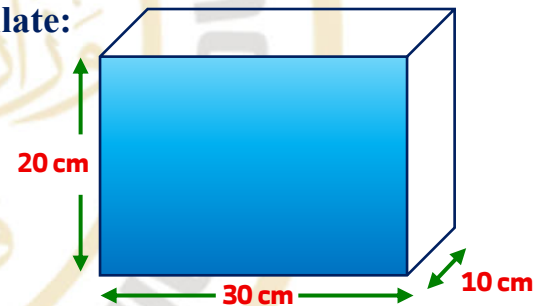
Given that the densities of mercury, water, and kerosene are **13600 kg/m³**, **1000 kg/m³**, and **800 kg/m³** respectively, and the acceleration due to gravity is $g = 9.8 \text{ m/s}^2$. The total pressure exerted by all the liquids on the bottom of the beaker is

- (A) $7.81 \times 10^3 \text{ N/m}^2$
 (B) $7.5 \times 10^3 \text{ N/m}^2$
 (C) $8 \times 10^3 \text{ N/m}^2$
 (D) $9.20 \times 10^3 \text{ N/m}^2$

Second: Essay Questions

- 5) A rectangular block has dimensions **25 cm × 20 cm × 10 cm** and a density of **2700 kg/m³**. It is placed on a horizontal table as shown. Calculate:

- (a) The pressure exerted by the block.
 (b) The maximum pressure that the block can exert.
 (c) How should the block be placed to produce the maximum pressure?





Physics

Second Secondary Grade

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Home Work

Week

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Name:

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د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

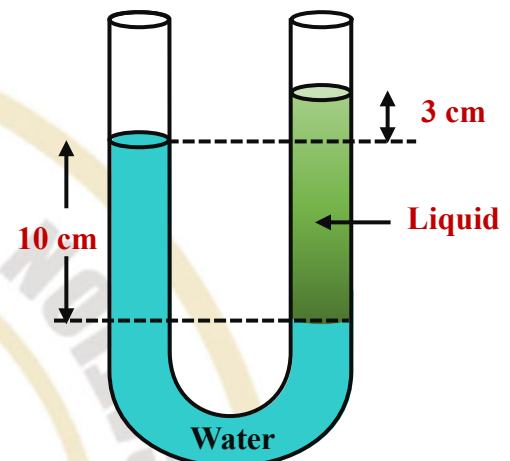
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Chapter 5| U-shaped tube

First: Multiple Choice

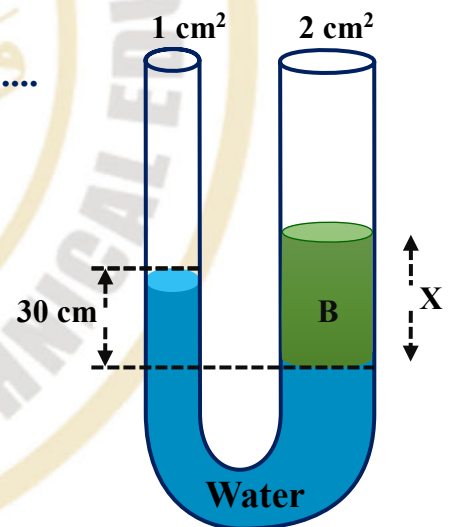
1) From the opposite figure, the relative density of the liquid is

- (A) $13/10$
- (B) $10/13$
- (C) $3/10$
- (D) $11/3$



2) If the relative density of liquid B is 0.8, the value of x equals....

- (A) 37.1 cm
- (B) 37.2 cm
- (C) 37 cm
- (D) 37.5 cm



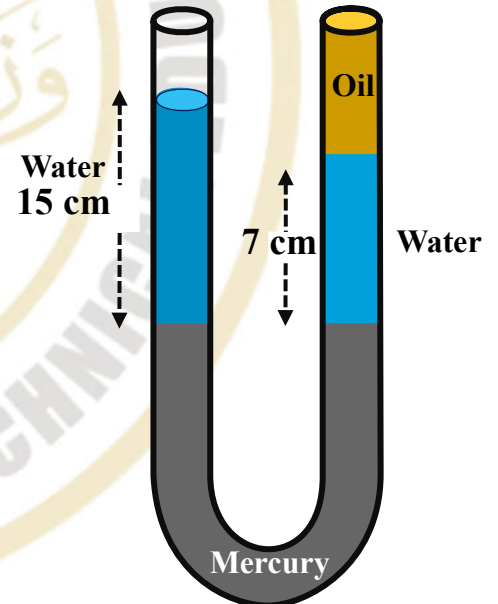
3) A U-shaped tube with two branches, the cross-sectional area of one branch is twice that of the other. Oil was poured into the wide branch, so the distance between the water surfaces in the two branches became **10 cm** and the height of the oil became **12 cm**. Then the relative density of the oil is

- (A) 1.6
- (B) 1.2
- (C) 0.86
- (D) 0.83

4) From the opposite figure:

If you know that the density of oil and water are = **800 Kg/m^3** , **1000 Kg/m^3** respectively. Then the height of the oil column is equal to.

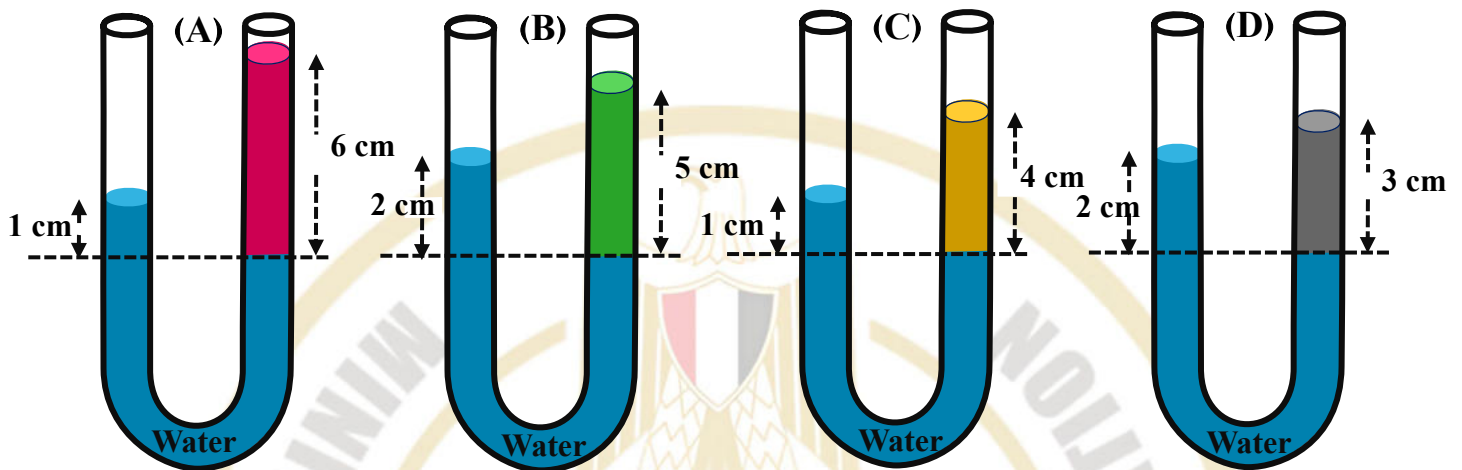
- (A) 9 cm
- (B) 12 cm
- (C) 10 cm
- (D) 8 cm





- 5) A U-shaped tube, the ratio of the cross-sectional areas of the tube is **1:2**. The tube contains a quantity of mercury. When a quantity of water is poured into one of its branches, the ratio of the height of the water to the height of the mercury above the separating surface between the mercury and the water is equal to.
- (A) Half the relative density of mercury.
 - (B) The relative density of mercury.
 - (C) Twice the relative density of mercury.
 - (D) The reciprocal of the relative density of mercury
- 6) In a U-shaped tube with uniform cross-section containing water, oil is poured into one of its arms. If the relative density of the oil is **0.8** and the height of the oil column is **20 cm**, the distance between the upper surfaces of the oil and the water is
- (A) 8 cm
 - (B) 4 cm
 - (C) 20 cm
 - (D) 16 cm

- 7) The figure represents U-shaped tubes for measuring the densities of different liquids, where the left branch in the tube contains water with a density of 1000 kg/m^3 .



Which of the following tubes has a relative density of liquid of 0.4 ?

- (A) A.
- (B) B.
- (C) D.
- (D) C.

- 8) A U-shaped tube of uniform cross-section contains water. Oil is then poured into one arm, causing the water surface to drop by 1.5 cm . The height of the oil column equals
Given that $\rho_o = 800 \text{ kg/m}^3$ and $\rho_w = 1000 \text{ kg/m}^3$.

- (A) 1.875 cm
- (B) 3.75 cm
- (C) 3.5 cm
- (D) 3.875 cm



9) A U-shaped tube with two uniform branches, its cross-sectional area is 2 cm^2 , and it contains oil with a density of 900 kg/m^3 . Alcohol was poured into one of its branches, so the surface of the oil in it decreased by 6 cm . If the height of the alcohol above the level of the separating surface is 13.69 cm , then the mass of the alcohol.....

- (A) 0.216 Kg
- (B) 21.6 Kg
- (C) 2.16 g
- (D) 21.6 g

density of the surrounding liquid is 1360 kg/m^3 , knowing that the cross-sectional area of the tube is 2 cm^2 .

10) In a U-shaped tube of uniform cross-section there is a quantity of mercury. Oil is poured into one arm and water is poured into the other until the mercury surfaces in the two arms are at the same horizontal level. The measured difference between the heights of the water and oil columns is 4 cm . Calculate the height of each of the oil and water columns, given that the relative density of the oil is 0.8 and the density of water is $1000 \text{ kg}\cdot\text{m}^{-3}$

Second: Essay

10) In a U-shaped tube of uniform cross-section there is a quantity of mercury. Oil is poured into one arm and water is poured into the other until the mercury surfaces in the two arms are at the same horizontal level. The measured difference between the heights of the water and oil columns is 4 cm . Calculate the height of each of the oil and water columns, given that the relative density of the oil is 0.8 and the density of water is $1000 \text{ kg}\cdot\text{m}^{-3}$

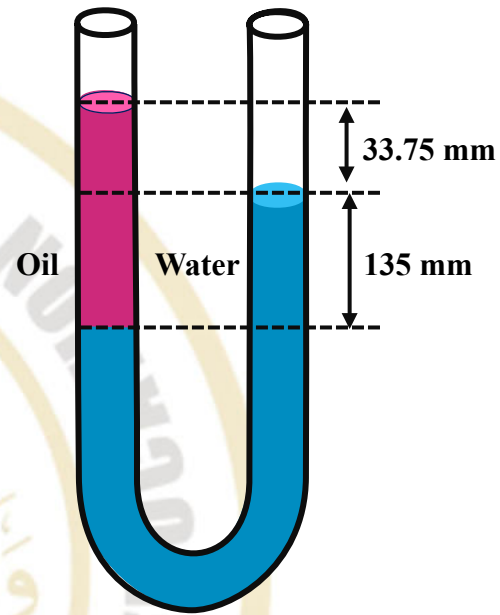
11) From the opposite figure:

If you know that the radius of the tube is **1 cm**, and the density of water is **1000 Kg/m³**.

Calculate

(a) the density of the oil and the weight of the oil column.

(b) the weight of the water column above the separating surface level.



12) A U-shaped tube, where the cross-sectional area of one arm is twice that of the other.

The tube contains water. Oil with a density of **900 kg/m³** is poured into the wider arm, causing the water surface in that arm to drop by **0.5 cm**. Calculate the height of the oil above the separating surface, assuming the density of water is **1000 kg/m³**.

-The end-

First: Multiple Choice

1	B	7	B
2	C	8	B
3	B	9	B
4	C	10	B
5	B	11	A
6	C	12	C

Second: Essay

13)

$$\frac{F_1}{F_2} = \frac{m_1}{m_2} = \frac{1}{2}$$

14)

$$\frac{m_1}{m_2} = \frac{F_1 \times a_2}{F_2 \times a_1} = \frac{1 \times 4}{1 \times 1} = \frac{4}{1}$$

**Group (A)****First: Multiple Choice**

1	D
2	B
3	C
4	D

Second: Essay

5)

- 1) Two forces equal in magnitude and opposite in direction represent the action and reaction forces.
- 2) Because each force acts on a different body — one force on the elephant and the other on the man — they do not act on the same object, so neither force can cancel the other out.
- 3)

$$\frac{a_{\text{elephant}}}{a_{\text{man}}} = \frac{m_{\text{man}}}{m_{\text{elephant}}} \rightarrow \frac{a_{\text{elephant}}}{a_{\text{man}}} = \frac{1}{100} \rightarrow a_{\text{man}} = 100 a_{\text{elephant}}$$

Group (B)

First: Multiple Choice

1	C
2	B
3	A
4	C

Second: Essay

5)

- 1) The action force is the force exerted by the man on the water using the oars, and the reaction force is the force exerted by the water on the oars, pushing the boat in the opposite direction.
- 2) Because the two forces are equal in magnitude and opposite in direction according to Newton's third law, but they act on different bodies (the water and the boat), this results in the motion of the boat and the lack of equilibrium.

3)

$$a = \frac{F}{m} = \frac{50}{250} = 0.2 \text{ m/s}^2$$

Group (C)

First: Multiple Choice

1	A
2	C
3	A
4	D

Second: Essay

5)

- 1) The action force: is the force with which the gases emitted from the base of the rocket are pushed downward, and the reaction force: is the force that pushes the rocket itself upward.
- 2) Because the action and reaction forces act on two different bodies.
- 3) $8 \times 10^6 \text{ N}$ = the upward thrust of the rocket = the downward thrust of the gases.

First: Multiple Choice

1	C	7	A
2	B	8	D
3	D	9	B
4	A	10	B
5	A	11	D
6	D	12	A

Second: Essay

13)

$$\rho_{Al} = \frac{m}{Vol} = \frac{270}{0.1} = 2700 \frac{Kg}{m^3}$$

$$(\rho_{Al})_{relative} = \frac{\rho_{Al}}{\rho_{\epsilon Lo}} = \frac{2700}{1000} = 2.7$$

14)

$$Vol_{oil} = h \cdot \pi r_{inner}^2 = 0.3 \times \pi (0.2)^2 = 0.038 m^3$$

$$m_{oil} = \rho_{oil} \cdot Vol_{oil} = 800 \times 0.038 = 30.16 Kg$$



Group (A)

First: Multiple Choice

1	A
2	A
3	B
4	A

Second: Essay

5)

(1) A

(2) E

Group (B)

First: Multiple Choice

1	A
2	B
3	D
4	B



Second: Essay

5)

$$Vol_{outer} = (0.12)^3 = 1.728 \times 10^{-3} m^3$$

$$Vol_{metal} = \frac{m}{\rho} = \frac{7}{7800} = 0.897 \times 10^{-3} m^3$$

$$Vol_{cavity} = Vol_{outer} - Vol_{metal} = 1.728 \times 10^{-3} - 0.897 \times 10^{-3} = 0.831 \times 10^{-3} m^3$$

∴ cube contains cavities (air gaps)

Group (C)

First: Multiple Choice

1	D
2	B
3	C
4	C

Second: Essay

5) D

Because: $\rho = \text{slope} = \Delta m / \Delta Vol.$

The lower the blood density in an anemia patient, the more severe the condition compared to others."

First: Multiple Choice

1	D	7	B
2	A	8	A
3	B	9	D
4	D	10	A
5	A	11	D
6	B		

Second: Essay

12)

$$Q_v = Q_{v1} + Q_{v2} + Q_{v3}$$

$$\frac{vol}{t} = \frac{vol}{t_1} + \frac{vol}{t_2} + \frac{vol}{t_3}$$

$$\frac{1}{t} = \frac{1}{1} + \frac{1}{0.5} + \frac{1}{0.25} = 7$$

$$\therefore t_3 \text{ taps together} = \frac{1}{7} \text{ hour}$$

13)

$$(Av)_{\text{capillaries}} = n (Av)_{\text{capillary}} \rightarrow 3 \times 30 = n (0.3 \times 0.05)$$

$$\therefore n_{\text{capillaries}} = 6000_{\text{capillary}}$$



Weekly assement

Week (8)

Group (A)

First: Multiple Choice

1	C
2	C
3	C
4	A

Second: Essay

5)

The total cross-sectional area of the capillaries is greater than the cross-sectional area of the main artery; therefore, the blood velocity decreases in the capillaries, since ($v \propto 1/A$).

Group (B)

First: Multiple Choice

1	A
2	D
3	C
4	D



Second: Essay

$$(1) \quad \eta_s = \frac{Fd}{Av} = \frac{4 \times 0.02}{2 \times 2} = 0.02 \text{ N.s /m}^2$$

$$(2) \quad F = \eta_s \frac{Av}{d} = 0.02 \times \frac{2 \times 4}{0.02} = 8 \text{ N}$$

Group (C)

First: Multiple Choice

1	A
2	C
3	B
4	D

Second: Essay

5)

$$F = \eta_s \frac{Av}{d} = 2.5 \times \frac{\pi \times (70 \times 10^{-2})^2 \times 0.1}{2.5 \times 10^{-3}} = 153.86 \text{ N} \approx 154 \text{ N}$$

First: Multiple Choice

1	C	7	B
2	D	8	A
3	A	9	D
4	C	10	D
5	C	11	A
6	C		

Second: Essay

12)

$$P = \rho gh = 1060 \times 10 \times 2 = 21200 \text{ N/m}^2$$

13)

$$P_{(\text{surface})} = P_1 - \rho_w gh_w = P_a + P_o gh_o$$

$$\therefore (2 \times 10^5) - (1000 \times 10 \times 5) = P_a + (800 \times 6.25 \times 10)$$

$$\therefore P_a = 10^5 \text{ pascal}$$

14)

$$1) P_{\text{bottom}} = \rho gh = (1000 \times 10 \times 2) = 2 \times 10^4 \text{ Pa}$$

$$2) F_{\text{bottom}} = P_{\text{bottom}} \cdot A = 2 \times 10^4 \times 0.5 \times 0.1 = 10^3 \text{ N}$$

$$3) P = \rho gh = (1000 \times 10 \times 1.6) = 16 \times 10^3 \text{ Pa}$$



Weekly assement

Week (9)

Group (A)

First: Multiple Choice

1	D
2	B
3	C
4	C

Second: Essay

5)

$$\rightarrow \rho g h_{\text{rectangle}} = 3 \rho g h_{\text{cube}} \rightarrow 10 = 3 h_{\text{cube}} \rightarrow h_{\text{cube}} = \frac{10}{3} \text{ cm}$$

Group (B)

First: Multiple Choice

1	A
2	A
3	A
4	B

Second: Essay

5)

$$\Delta P = \rho g \Delta h = 1015 \times 10(1.8 - 1.2) = 6090 \text{ Pa}$$

Group (C)

First: Multiple Choice

1	C
2	B
3	C
4	A

Second: Essay

5)

$$1) P = \frac{mg}{A} = \frac{\rho V_{ol} g}{A} = \rho h g = 2700 \times 0.2 \times 10 = 5400 \text{ Pa}$$

$$2) P_{max} = 2700 \times 0.3 \times 10 = 8100 \text{ Pa}$$

$$3) P_{min} = 2700 \times 0.1 \times 10 = 2700 \text{ Pa}$$



Physics

Second Secondary Grade

20
26

Home Work

Week



Name:

Class:

School:

إعداد

عبد الله مصطفى - حسن أشرف

مراجعة

محمد عنتر - مجدي فتحي
عمرو مالي

مكتب مستشار العلوم

عبد الله مصطفى - سعيد محمد

إشراف

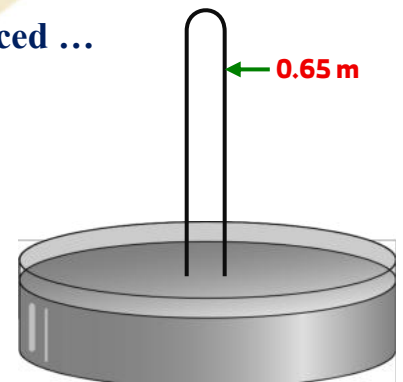
د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام

First: Multiple Choice Questions

- 1) If the atmospheric pressure at sea level is **76 cmHg**, and the temperature decreases significantly during winter on a very cold night, which of the following values represents the atmospheric pressure in winter?
- (A) 0.8 mHg
(B) 1 atm
(C) 0.9 bar
(D) 750 Torr
- 2) If the difference in air pressure inside a flying aircraft and outside it is **0.1 atm**, then it is equivalent to
- (A) 7.6 mHg
(B) 0.076 mHg
(C) 0.76 mHg
(D) 76 mHg
- 3) The figure shows a mercury barometer placed in a location to measure the atmospheric pressure there. The barometer reading indicates that it is placed ...
- (A) In a valley between two mountains
(B) At sea level
(C) On the top of a mountain
(D) At the bottom of a deep well

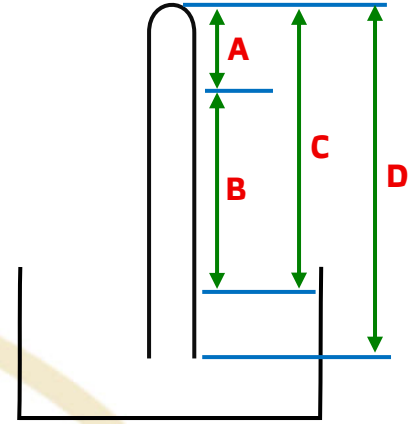




- 4) A solid rectangular prism whose material has a density of $2700 \text{ kg}\cdot\text{m}^{-3}$, and whose dimensions are **40 cm**, **30 cm**, **20 cm**, with the acceleration due to gravity $g = 10 \text{ m}\cdot\text{s}^{-2}$, has a maximum pressure of:
- (A) 1.08 bar
 - (B) 0.108×10^5 bar
 - (C) 0.0108 bar
 - (D) 0.108 bar
-
- 5) If the usual atmospheric pressure is **76 cm Hg**, and a hurricane causes the atmospheric pressure to decrease by **10%**, then the new atmospheric pressure becomes:
- (A) 0.684 m Hg
 - (B) 68.4 m Hg
 - (C) 0.076 m Hg
 - (D) 7.6 m Hg
-
- 6) Which of the following factors does **not** affect the height of the mercury column in a barometer:
- (A) Mercury density
 - (B) Cross-sectional area of the tube
 - (C) Acceleration due to gravity
 - (D) Atmospheric pressure

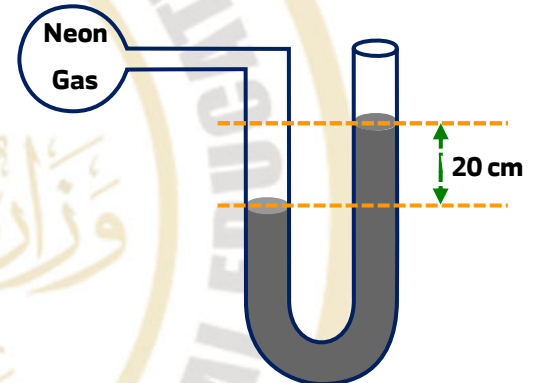
7) In the opposite figure, the atmospheric pressure in the mercury barometer is equal to the height

- (A) A
- (B) B
- (C) C
- (D) D



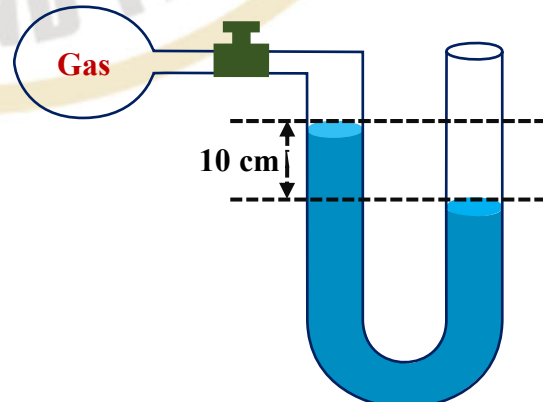
8) In the opposite figure, a mercury manometer is connected to a closed arm containing some neon gas. Given that the atmospheric pressure is **760 mm Hg**, the pressure of the neon gas is

- (A) 780 cm Hg
- (B) 78 cm Hg
- (C) 96 cm Hg
- (D) 960 cm Hg



9) The figure shows a manometer whose tube contains water of density **1000 kg/m³**, with $g = \mathbf{9.8 \text{ m/s}^2}$, and the gas pressure in the reservoir is $P_{\text{gas}} = \mathbf{1.003 \times 10^5 \text{ N/m}^2}$. The atmospheric pressure acting on the open end of the manometer is

- (A) 0.84 atm
- (B) 0.92 atm
- (C) 0.98 atm
- (D) 1.06 atm





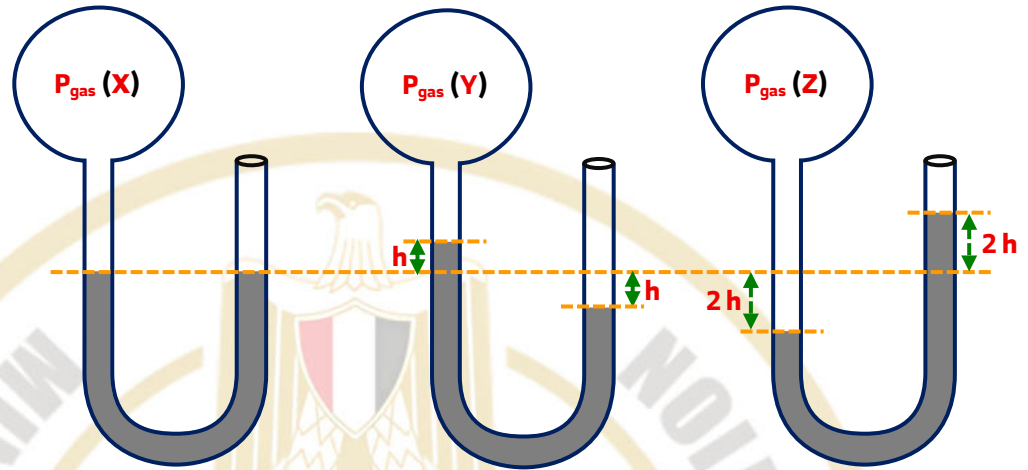
- 10) When water is replaced by mercury in a manometer that measures a small pressure difference, the resulting liquid column height becomes
- (A) greater
(B) smaller
(C) Does not change
(D) Increases by the same ratio by which the density decreases
- 11) In an open-ended manometer, the sign of the height difference between the liquid levels in the two arms (**h**) is positive when the gas pressure in the reservoir becomes
- (A) Less than atmospheric pressure
(B) Greater than atmospheric pressure
(C) Equal to atmospheric pressure
(D) Greater than atmospheric pressure by an amount that causes the liquid to rise only in the open arm without change in the closed arm

Second: Essay Questions

- 12) A tower has a height of **90 m**. If the atmospheric pressure at ground level is **76 cm Hg**, and the density of air is **1.25 kg/m³**, the density of mercury is **13600 kg/m³**, and **$g = 9.8 \text{ m/s}^2$** , calculate the atmospheric pressure at the top of the tower

13) The figure shows three identical manometers, each connected to a reservoir containing a different gas: **X**, **Y**, and **Z**.

1. The gas whose pressure is equal to atmospheric pressure is
2. The correct order of the pressures of the enclosed gases is



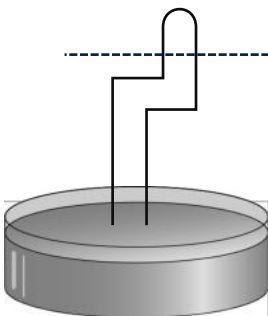
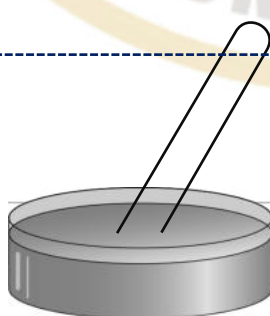
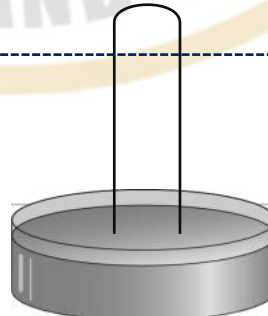
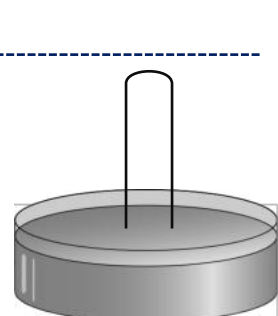
14) What is the reading of a barometer placed on the top of a mountain with a height of **5.1 km** above sea level, if its reading at sea level is **0.75 m Hg**?

Given: the density of air is **1.2 kg/m³**, and the density of mercury is **13600 kg/m³**.

- The end -

Chapter 5| Barometer and Manometer**Group (A)****First: Multiple Choice Questions**

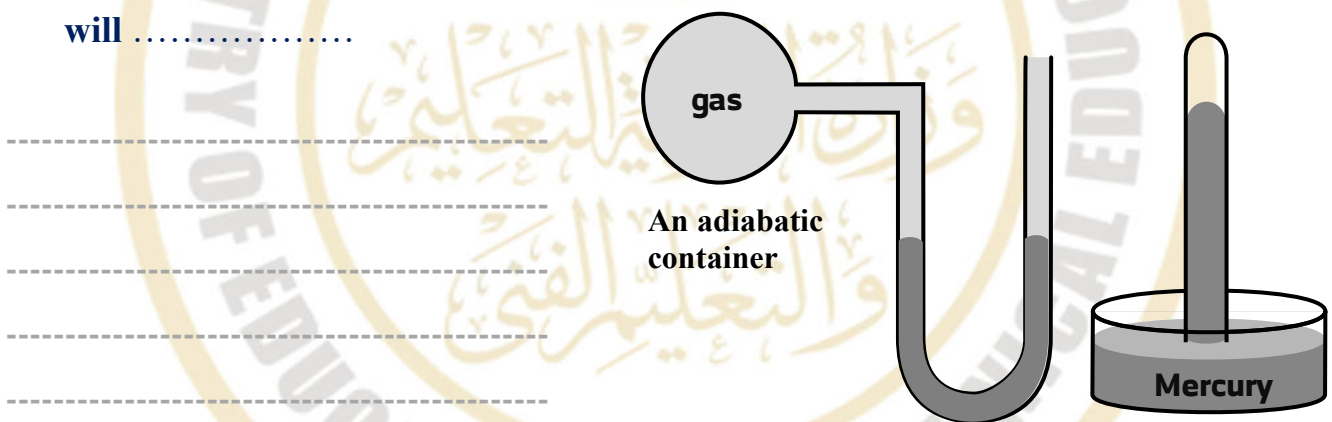
- 1) If the pressure at a point is $10^5 \text{ kg} \cdot \text{m}^{-1} \cdot \text{s}^{-2}$, then it is equivalent to
- (A) 76 cm Hg
(B) 10^5 bar
(C) 1 bar
(D) 760 cm Hg
- 2) If the standard atmospheric pressure is **1 atm**, and a person climbs a skyscraper carrying a barometer, then notices that the pressure at one of the floors has decreased by **5%**, which of the following choices represents the correct barometer reading?
- (A) 74.2 cm Hg
(B) 73.2 cm Hg
(C) 72.2 cm Hg
(D) 75.2 cm Hg
- 3) All of the following barometers can be used to measure atmospheric pressure except ...

**(D)****(C)****(B)****(A)**

- 4) The ratio between the length of the Torricellian vacuum in a barometer at the top of a mountain and its length at the bottom of the mountain is
- (A) Greater than one
(B) Less than one
(C) Equal to one
(D) Increases as atmospheric pressure decreases

Second: Essay Questions

- 5) The two figures represent a mercury barometer and a mercury manometer at sea level. If both devices are taken to the top of a mountain, then:
1. The height of the mercury column in the barometer will
 2. The height of the mercury column in the open arm of the manometer will

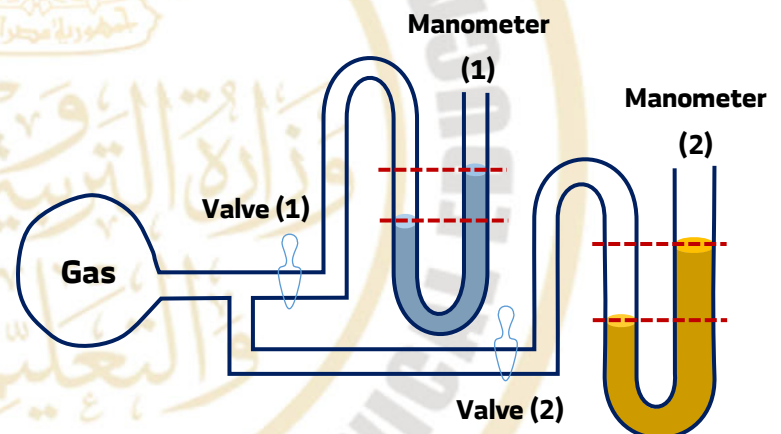


Group (B)

First: Multiple Choice Questions

1) The figure shown represents two manometers connected to a gas reservoir. If the two manometers differ in the radius of their tubes and contain different liquids, which of the following reasons explains the difference in the liquid-level displacement in the two manometers?

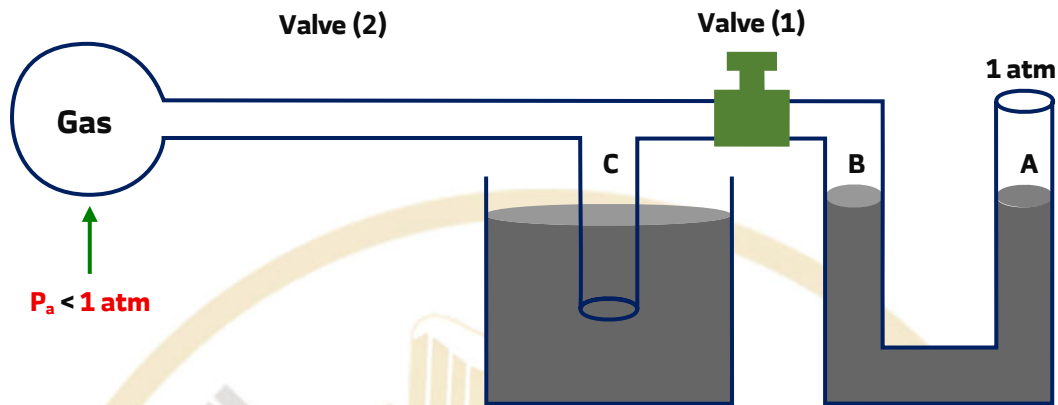
- (A) The radius of manometer (1) is smaller than the radius of manometer (2).
- (B) The density of the liquid in manometer (1) is greater than the density of the liquid in manometer (2).
- (C) The density of the liquid in manometer (1) is less than the density of the liquid in manometer (2).
- (D) Valve (1) is higher than valve (2).



2) A barometer reads **76 cm Hg** at the bottom of a building and **75.8 cm Hg** at the top. If the average density of air is **1.36 kg/m³**, then the height of the building equals

- (A) 12 m
- (B) 20 m
- (C) 54 m
- (D) 150 m

3) What happens to the mercury level at points **A**, **B**, and **C** when valves **1** and **2** are opened in the diagram?



- (A) C rises while B falls and A rises
- (B) A and B remain constant while C falls
- (C) C remains unchanged, while A and B rise
- (D) A falls, while B and C rise

4) A gas is confined in its container at a pressure of **1.267 atm**. One student wants to measure this pressure using a water manometer, while another student wants to measure it using a mercury manometer. Which measurement will be more accurate, knowing that atmospheric pressure is **10^5 N/m^2** ?

- (A) Measurement using the water manometer is more accurate
- (B) Measurement using the mercury manometer is more accurate
- (C) Both give the same degree of accuracy
- (D) Accuracy depends only on the value of atmospheric pressure, not on the type of manometer

Second: Essay Questions

- 5) A student wanted to determine the density of air in a certain region using a mercury barometer. If the barometer reading was **75 cm Hg** at ground level, and after climbing a mountain in that region with a height of **136 m**, the barometer reading became **73.75 cm Hg**, and knowing that the density of mercury is **13600 kg/m³**, what is the density of the air he measured?

Group (C)

- 1) If a U-tube manometer is used with a wider tube, the manometer reading will
- (A) Decrease
 - (B) Increase
 - (C) Remain constant
 - (D) Depend only on the tube cross-sectional area, unrelated to the pressure difference
- 2) In a test to measure the air pressure inside the lungs, Amr blew with all his strength into one end of a mercury manometer, causing the mercury in the free (open) arm to rise 5 cm relative to the limb connected to Amr. What is the pressure inside his lungs?
- Given: atmospheric pressure = **$1.013 \times 10^5 \text{ N}\cdot\text{m}^{-2}$** , mercury density = **$13600 \text{ kg}\cdot\text{m}^{-3}$** , gravitational acceleration $g = 10 \text{ m}\cdot\text{s}^{-2}$.
- (A) $1.02 \times 10^5 \text{ Pa}$ (B) $1.08 \times 10^5 \text{ Pa}$ (C) $1.15 \times 10^5 \text{ Pa}$ (D) $1.34 \times 10^5 \text{ Pa}$

3) When the top of the mercury barometer tube (Torricelli's vacuum) is broken, the height of the mercury column in the tube will

- (A) Remain as it is
- (B) Increase and spill out of the tube
- (C) Fall to the level of the mercury in the reservoir
- (D) Oscillate briefly and then return to its original height

4) Pressure **800 cm Hg** pressure **0.08 bar**.

- (A) Greater than
- (B) Less than
- (C) Equal to
- (D) Cannot be compared without converting units

Second: Essay Questions

5) The figure represents a mercury manometer containing a gas whose pressure is **100 cm Hg**.

Calculate the atmospheric pressure acting on the open end of the manometer in atm.

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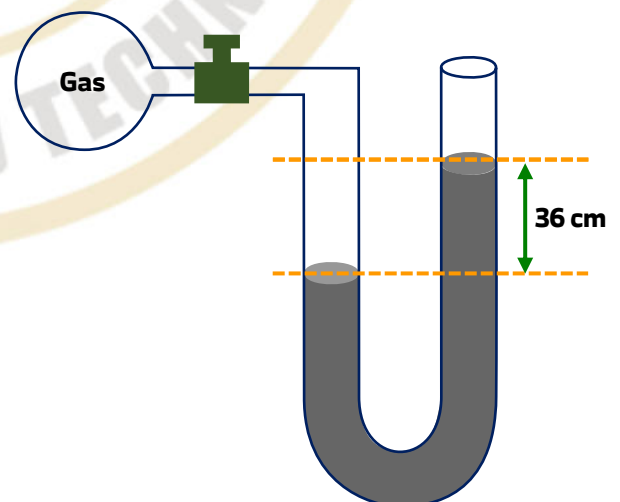
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Physics

Second Secondary Grade

20
26

Home Work

Week



Name:

Class:

School:

إعداد

عبد الله مصطفى - حسن أشرف

مراجعة

محمد عنتر - مجدي فتحي
عمرو مالي

مكتب مستشار العلوم

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إشراف

د/ عزيزة رجب خليفة
مستشار العلوم

إشراف عام

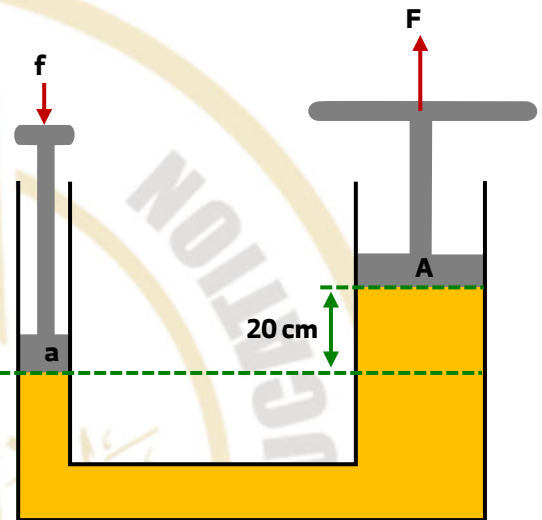
د/ هالة عبد السلام
رئيس الإدارة المركزية للتعليم العام

Chapter 5| Pascal's Principle

First: Multiple Choice Questions

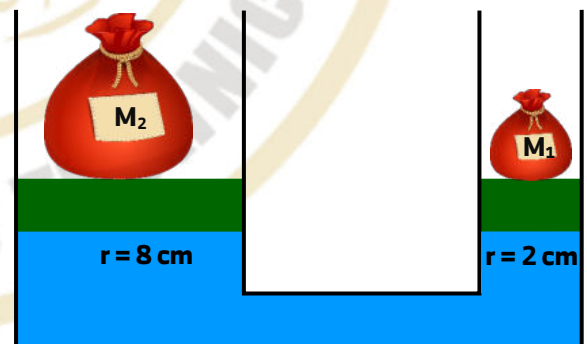
- 1) If the area of the small piston is 80 cm^2 and the area of the large piston is 0.1 m^2 , the density of the oil used is 860 kg/m^3 , and the force applied to the small piston is 200 N , then the pressure directly beneath the large piston equals ($g = 10 \text{ m/s}^2$)

- (A) 23280 N/m^2
- (B) 25000 N/m^2
- (C) 1720 N/m^2
- (D) 1900 N/m^2



- 2) A hydraulic press is balanced in the shown position. Which of the following relations is correct? (Given that $g = 10 \text{ m/s}^2$)

- (A) $M_2 = 8 M_1$
- (B) $M_2 = 6 M_1$
- (C) $M_2 = 16 M_1$
- (D) $M_2 = 10 M_1$





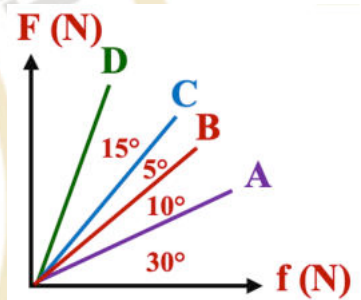
- 3) In a car-wash hydraulic lift, if the diameter of the small piston is **4 cm** and the diameter of the large piston is **40 cm**, the pressure required to lift a car of mass **2000 kg** equals ...
(Given **$g = 10 \text{ m/s}^2$**)
- (A) $1.59 \times 10^2 \text{ N/m}^2$
 - (B) $1.59 \times 10^3 \text{ N/m}^2$
 - (C) $1.59 \times 10^4 \text{ N/m}^2$
 - (D) $1.59 \times 10^5 \text{ N/m}^2$
- 4) The pressure under the small piston **equals** the pressure under the large piston in a hydraulic press when
- (A) the two pistons are at the same horizontal level
 - (B) the small piston is at a higher level than the large piston
 - (C) the large piston is at a higher level than the small piston
 - (D) the fluid between the pistons contains gas bubbles
- 5) In an ideal hydraulic press, which of the following ratios **equals one**?
- (A) pressure on the large piston to pressure on the small piston
 - (B) work done on the small piston to work output by the large piston
 - (C) force applied to the small piston to force produced on the large piston
 - (D) displacement of the small piston to displacement of the large piston

6) If the ratio between the radii of two cylindrical pistons in a hydraulic press is **2:7**, and both pistons are at the same horizontal level, then the ratio of the pressure under the large piston to the pressure under the small piston equals

- (A) 7:2
- (B) 49:4
- (C) 4:49
- (D) 1:1

7) When plotting the graph of the output force on the large piston (**F**) against the input force on the small piston (**f**) for a hydraulic press, which of the illustrated graphs is correct?

- (A) A
- (B) B
- (C) C
- (D) D



8) A hydraulic press has piston radii of **2 cm** and **8 cm**. A force of **100 N** is applied to the small piston. ($g = 10 \text{ m/s}^2$)

	The maximum mass that can be lifted	The mechanical advantage
(A)	40 Kg	4
(B)	80 Kg	8
(C)	160 Kg	16
(D)	320 Kg	32

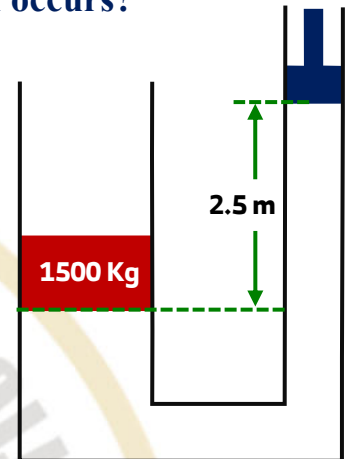


- 9) In a car-wash, the diameter of the compressed-air pipe in the hydraulic lift is **2 cm** and the diameter of the large piston is **32 cm**. The air pressure required to lift a car of mass **1800 kg** equals ($g = 9.8 \text{ m/s}^2$)
- (A) $2.19 \times 10^5 \text{ Pa}$
(B) $6.91 \times 10^4 \text{ Pa}$
(C) $5.47 \times 10^6 \text{ Pa}$
(D) $3.14 \times 10^3 \text{ Pa}$
-
- 10) In an ideal hydraulic press, the oil originally used (density = **900 kg/m^3**) is replaced by another fluid of density **1800 kg/m^3** . The mechanical advantage of the press
- (A) increases to double
(B) decreases to half
(C) increases four times
(D) remains the same
-
- 11) What magnitude of force must be applied to the small piston to raise a car of mass **1700 kg** with a hydraulic press, if the car rises **1.5 cm** when the small piston moves **75 cm** downward? ($g = 10 \text{ m/s}^2$).
- (A) 34 N
(B) 340 N
(C) 1700 N
(D) 11.3 N

- 12) In the hydraulic press shown: if the mass of the large cylinder is **1500 kg** and its cross-sectional area is **0.2 m²**, the cross-sectional area of the small piston (assumed massless) is **40 cm²**, and the press is completely filled with oil of specific density = **0.8**. What is the force that must be applied to the small piston so that equilibrium occurs?

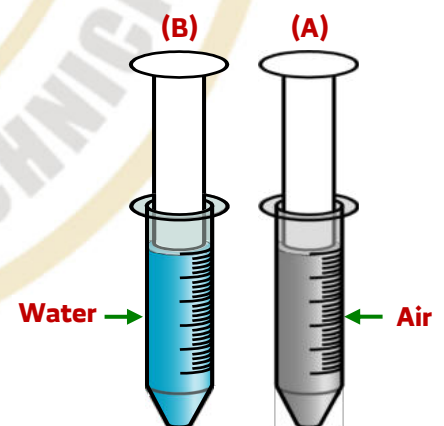
(Take **g = 10 m/s²**)

- (A) 180 N
(B) 200 N
(C) 220 N
(D) 260 N

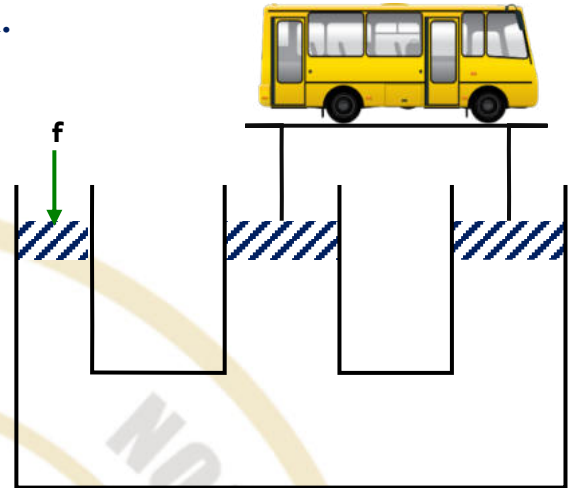


Second: Essay Questions

- 13) In the figure, two plastic syringes are shown. When piston (A) is pressed, it moves downward, while when piston (B) is pressed, it does not move. Explain why



- 14) Two pistons are used to lift a bus of mass **3 tons**, each having a cross-sectional area of **0.1 m^2** , and both are connected to a third piston on which a force of **200 N** is applied. Calculate the cross-sectional area of the small piston.



- 15) Calculate the air pressure (**in bar**) that must be applied to the small piston of a hydraulic press to lift a car of mass **1.5 ton** the large piston in a car-lubrication station, given that the cross-sectional area of the large piston is **0.03 m^2** . The mechanical advantage of this press is **100**. Also calculate the radius of the small piston. (Use **$g = 10 \text{ m/s}^2$** and **$\pi = 3.14$**)

- The end -

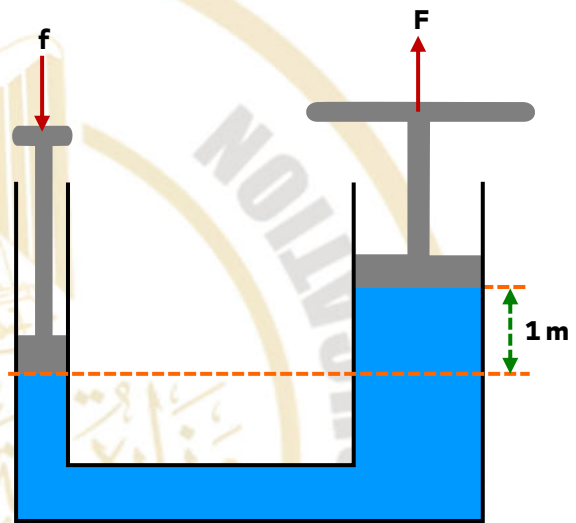
Chapter 5| Pascal's Principle

Group (A)

First: Multiple Choice Questions

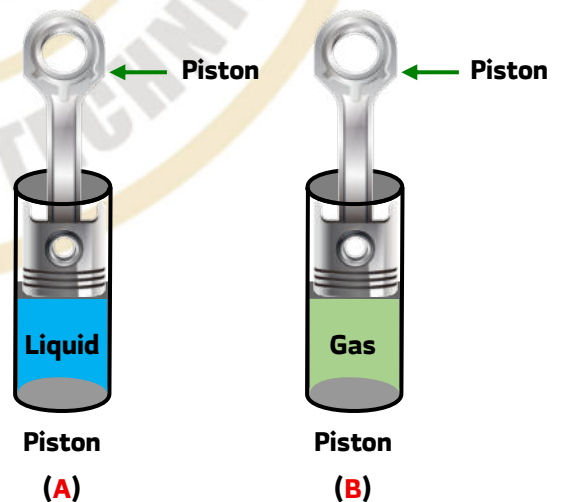
1) In the shown figure: given that $\rho_w = 1000 \text{ kg/m}^3$ and $g = 10 \text{ m/s}^2$, the pressure at the small piston is greater than the pressure at the large piston by

- (A) 100 N/m^2
- (B) 1000 N/m^2
- (C) 10000 N/m^2
- (D) 10 N/m^2



2) Which of the two pistons moves downward when a mass of 50 kg is placed on top of the piston?

- (A) A
- (B) B
- (C) A and B
- (D) Neither of them





- 3) In an ideal hydraulic press, which of the following ratios is **greater than one**?
- (A) The pressure under the large piston to the pressure under the small piston
 - (B) The work done on the small piston to the work output by the large piston
 - (C) The speed of motion of the small piston to the speed of motion of the large piston
 - (D) The time of motion of the small piston to the time of motion of the large piston
- 4) If the ratio between the radii of the two cylindrical pistons in a hydraulic press is **$9/2$** , then the ratio of the output force on the large piston to the input force on the small piston equals
- (A) $9/2$
 - (B) $81/4$
 - (C) $4/81$
 - (D) $1/1$

Second: Essay Questions

- 5) In a car service station, a hydraulic press has piston radii of **4 cm** and **30 cm**. The maximum force that can be applied to the small piston is **200 N**. A car of mass **1 ton** is placed on the hydraulic press. Can this press lift the car? (Take the acceleration due to gravity as **10 m/s^2**)

Group (B)

First: Multiple Choice Questions

- 1) A hydraulic press has a large piston whose cross-sectional area is **ten times** that of the small piston. If a force of **100 N** is applied to the small piston, the force exerted on the large piston equals
- (A) 2000 N
(B) 1000 N
(C) 100 N
(D) 10 N
- 2) A hydraulic press has a small piston area of **10 cm²** and a large piston area of **200 cm²**. It is required to lift a load of mass **1 ton** using this press. If **20%** of the energy is lost as thermal energy due to friction between the pistons, what is the force that must be applied to the small piston in this case? (Assume **$g = 9.8 \text{ m/s}^2$**)
- (A) 490 N
(B) 600 N
(C) 612.5 N
(D) 784 N



3) A hydraulic press has an efficiency of **98%**. The physical quantity represented by the remaining **2%** (the loss percentage) is

- (A) Pressure
- (B) Work
- (C) Force
- (D) Displacement

4) If the cross-sectional area of the large piston in a hydraulic press is **three times** the cross-sectional area of the small piston, what is the ratio of the volume of fluid displaced downward in the small piston's cylinder to the volume of fluid displaced upward in the large piston's cylinder during operation?

- (A) 1:3
- (B) 3:1
- (C) 1:9
- (D) 1:1

Second: Essay Questions

5) A hydraulic press has a small piston diameter **10 cm**. A force of **800 N** is applied to it. The large piston diameter is **100 cm**. Given $g = 10 \text{ m/s}^2$ and $\pi = 3.14$, find:

- (a) The largest mass that can be lifted by the large piston.
- (b) The pressure acting on both the large and the small pistons.

Group (C)

First: Multiple Choice Questions

1) Two connected cylinders have radii of **3 cm** and **8 cm**. A mass of **27 kg** is placed on the small piston. The force that must act on the large piston to keep the system in equilibrium equals ($g = 9.8 \text{ m/s}^2$).

(A) 1881.6 N

(B) 264.6 N

(C) 705.6 N

(D) 37.2 N

2) When a large pressure is applied to a liquid confined inside a thin-walled metal container, the container may bulge or burst because the pressure is transmitted completely through the liquid. This is explained by _____.

(A) Boyle's Law

(B) Pascal's Principle

(C) Newton's Third Law

(D) Newton's Second Law

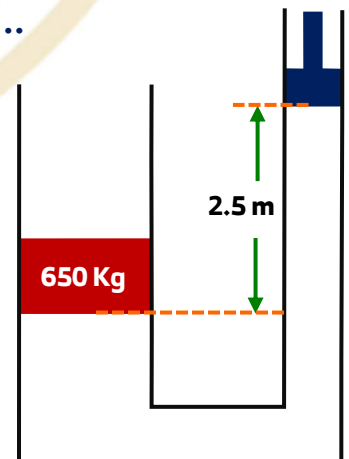
3) In the hydraulic press shown, the mass of the large piston is **650 kg** and its cross-sectional area is **0.1 m^2** . The cross-sectional area of the small piston is **15 cm^2** and its mass is negligible. The press is completely filled with oil of relative density **0.8**. The value of the force (**f**) required for equilibrium equals

(A) 220 N

(B) 150 N

(C) 67.5 N

(D) 30 N



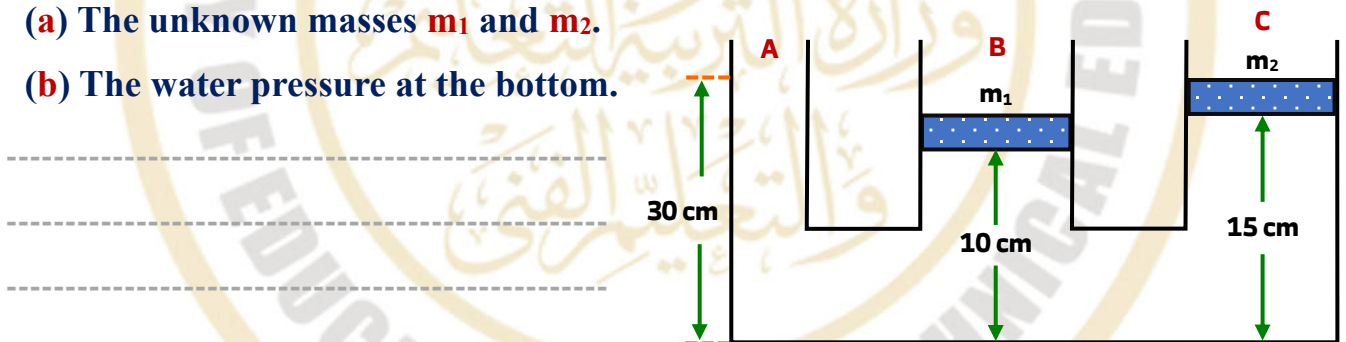
4) In an ideal hydraulic press, the mechanical advantage of the device was measured while operating with a fluid of density 600 kg/m^3 . The fluid was then replaced with another fluid of density 1500 kg/m^3 , without changing the dimensions of the pistons. The ratio of the mechanical advantage in the first case to that in the second case equals

- (A) $5/2$
- (B) $2/5$
- (C) $4/1$
- (D) $1/1$

Second: Essay Questions

5) If the cross-sectional areas of pistons A, B, and C are 5 cm^2 , 12 cm^2 , and 8 cm^2 respectively, and the system is filled with water, find:

- (a) The unknown masses m_1 and m_2 .
- (b) The water pressure at the bottom.





Physics

Second Secondary Grade

20
26

Home Work

Week



Name:

Class:

School:

إعداد

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مراجعة

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First: Multiple Choice Questions

1) If the volume of a given amount of gas at 0°C is 450 cm^3 , its volume at 91°C , assuming constant pressure, is

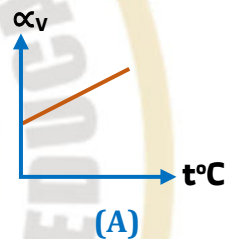
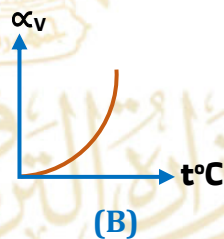
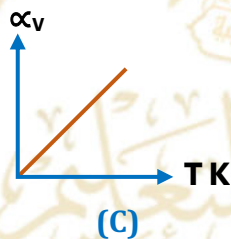
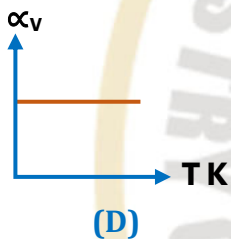
(A) 321 cm^3

(B) 421 cm^3

(C) 600 cm^3

(D) 333.5 cm^3

2) Which graph correctly represents the relationship between the absolute temperature of a gas and its coefficient of volumetric expansion at constant pressure?



3) Which mathematical expression correctly represents the relationship between the temperature of a given amount of gas on the Celsius scale and its volume at constant pressure?

(A) $\frac{V_{ol1}}{V_{ol2}} = \frac{t_2}{t_1}$

(B) $\frac{V_{ol1}}{V_{ol2}} = \frac{1+\alpha_v t_1}{1+\alpha_v t_2}$

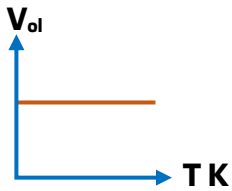
(C) $\frac{V_{ol1}}{V_{ol2}} = \frac{t_1}{t_2}$

(D) $\frac{V_{ol1}}{V_{ol2}} = \frac{1+\alpha_v t_2}{1+\alpha_v t_1}$

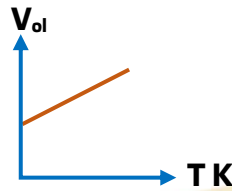


- 4) A gas sample has volume **4 L** at **100°C**. The required change in temperature (in kelvins) to reduce its volume to quarter of its initial value is
- (A) 25 K
(B) 75 K
(C) 93.25 K
(D) 279.75 K
-
- 5) If the absolute temperature of a gas increases by **20%**, its volume
- (A) decreases by 20% (B) increases by 20%
(C) decreases by 25% (D) increases by 25%
-
- 6) If the volume of a given amount of gas at **0°C** equals **1 L**, the temperature required to increase the gas volume by **1 L** (at constant pressure) is
- (A) 273°C
(B) 373°C
(C) 273 K
(D) 373 K
-
- 7) An open vessel contains a gas of volume **273 cm³** at **0°C**. The volume of gas that leaves the vessel if the vessel is heated by **0.5 K** is
- (A) 136.5 cm³
(B) 0.5 cm³
(C) 273.5 cm³
(D) 3.6×10^{-3} cm³

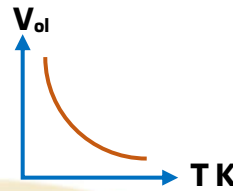
8) Which graph correctly represents the relationship between the volume of a given amount of gas and its temperature at constant pressure?



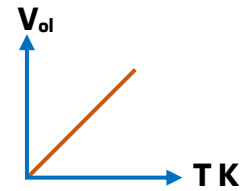
(D)



(C)



(B)



(A)

Second: Essay Questions

9) A gas has a volume of 200 cm^3 at 27°C . Calculate: its volume at 77°C

10) In Charles's experiment to determine the coefficient of volumetric expansion of a gas at constant pressure, the length of the air column was 12 cm when the tube was immersed in crushed ice, and it became 16.4 cm at 100°C .

Calculate: the value of the coefficient of volumetric expansion of the gas at constant pressure.

- The end -

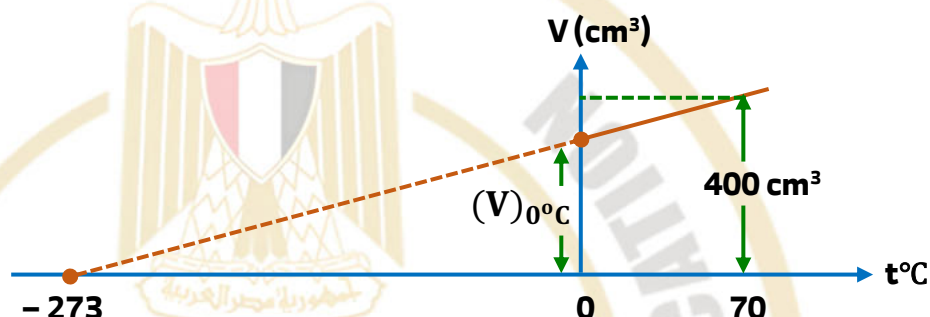
Chapter 6| Charle's law

Group (A)

First: Multiple Choice Questions

- 1) The opposite graph represents the relationship between the volume V of a given amount of gas and its temperature in degrees Celsius ($t^{\circ}\text{C}$). From the graph, the value of $V(0^{\circ}\text{C})$ is

- (A) 275.7 cm^3
- (B) 546.5 cm^3
- (C) 318.4 cm^3
- (D) 373.2 cm^3



- 2) A quantity of gas at 25°C is heated to 30°C while its pressure remains constant, and its volume increases by 1.5 cm^3 . Its original volume is

- (A) 70.4 cm^3
- (B) 81.9 cm^3
- (C) 89.4 cm^3
- (D) 90.4 cm^3

- 3) A certain mass of gas has a volume of 4 cm^3 at 25°C . Its new volume when its temperature is lowered to -50°C , assuming constant pressure, is

- (A) 1 cm^3
- (B) 1.5 cm^3
- (C) 3 cm^3
- (D) 2 cm^3

4) The correct mathematical expression of Charles's law is

- (A) $P \cdot V_{ol} = \text{Constant}$
- (B) $V_{ol} / T = \text{Constant}$
- (C) $P / T = \text{Constant}$
- (D) $P V_{ol} / T = \text{Constant}$

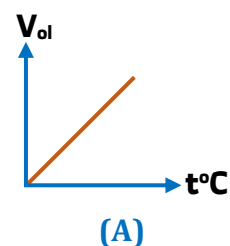
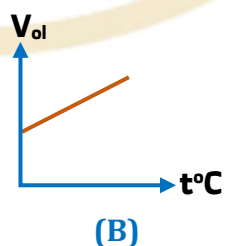
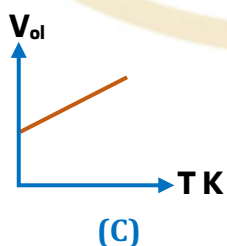
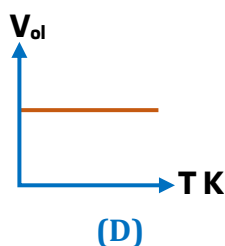
Second: Essay Questions

5) A quantity of gas has a volume of **4 L** at a temperature of **27°C**. Its temperature is increased while the pressure remains constant, causing its volume to increase by **5 L**. Calculate: the increase in its temperature.

Group (B)

First: Multiple Choice Questions

1) The correct graph that represents the relationship between the volume of a given amount of gas and its temperature at constant pressure is





- 2) If the change in volume of a certain mass of gas is 21.978 cm^3 , and the change in temperature at constant pressure is 60°C , given that the original volume of the gas at 0°C is 100 cm^3 , then the coefficient of volumetric expansion of the gas at constant pressure is
- (A) 3.66 K^{-1}
(B) 0.366 K^{-1}
(C) 0.0366 K^{-1}
(D) 0.00366 K^{-1}
- 3) The increase in volume of a given amount of gas at constant pressure depends on
- (A) The volume of the gas at 0°C and the change in the gas temperature
(B) The volume of the gas at 0°C and the type of gas
(C) The change in the gas temperature and the type of gas
(D) It is constant for all gases
- 4) A given quantity of gas has a volume of 1 L . If its temperature is increased by 1°C at constant pressure, the increase in its volume will be
- (A) 273 L
(B) 0.00366 L
(C) 373 L
(D) 0.00268 L



Second: Essay Questions

- 5) A quantity of gas has a volume of **3 L** at a temperature of **27°C**. Its temperature is raised to **227°C** while the pressure remains constant.

Calculate: its volume after the temperature increase.

Group (C)

First: Multiple Choice Questions

- 1) When heating an open vessel containing a gas, the volume of the gas in the vessel after heating will
- (A) Decrease
 - (B) Increase
 - (C) Remain constant
 - (D) Decrease or increase depending on the amount of temperature rise
- 2) **1 liter** of oxygen gas is at **0°C**. Its temperature is raised by **273°C** while the pressure remains constant. Its volume then becomes
- (A) 1 L
 - (B) 2 L
 - (C) 273 L
 - (D) 0.5 L



3) The coefficient of volumetric expansion of a gas at constant pressure is equal to

(A) $\frac{1}{273} \text{ K}$

(B) $\frac{1}{273} \text{ K}^{-1}$

(C) $-\frac{1}{273} \text{ K}^{-1}$

(D) $\frac{1}{273} ^\circ\text{C}$

4) A capillary tube of length **20 cm** contains a **5 cm** thread of mercury that traps a quantity of air whose length is **10 cm** at **30°C**. The maximum temperature that can be measured with this tube without the mercury spilling out is

(A) 318°C

(B) 45°C

(C) 454.5°C

(D) 181.5°C

Second: Essay Questions

5) A quantity of gas at a temperature of **17°C** is heated by **100°C** while its pressure remains constant, causing its volume to increase by **2.5 cm³**.

Calculate: its volume before heating.

– The end –

كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

